City of Falls Church

# BIKESHARE RIDERSHIP ANALYSIS

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Developed with assistance from:

FOURSQUARE ITP
INTEGRATED TRANSPORTATION PLANNING

The Little City
CITY OF FALLS CHURCH

# Executive Summary

## OVERVIEW

The City of Falls Church Bikeshare Ridership Analysis was requested by the City of Falls Church to guide the development of Capital Bikeshare within the City over the next several years. The study includes a detailed market analysis to identify station locations, as well as financial and ridership forecasts.

Capital Bikeshare acts as an extension of the Washington region's public transportation network. Upwards of 70 percent of trips are taken by Capital Bikeshare annual and monthly members, who incorporate bikeshare into their daily transportation. Many of the busiest bike share stations in the region are located at transit hubs, where bikeshare riders can transfer to bus, rail, and metro. For Falls Church, bikeshare is a tool to better connect the city to nearby transportation and provide a new alternative to driving for City residents and visitors. As the city continues to redevelop its main commercial corridors of Broad Street and Washington Street, bikeshare can reduce car dependency and parking demand.

## MARKET STUDY

Planning for system implementation began with a market study and station siting recommendations. The market study included a propensity analysis, an inventory of key destinations, and an analysis of Capital Bikeshare performance in areas within the current bikeshare network with similarities to City of Falls Church. The study found that bikeshare demand is concentrated within the city's main corridors of Washington Street and Broad Street. These two corridors feature extensive mixed-use development, with population densities approaching those found in Washington D.C. and Arlington's built-up metro corridors. Overall, the study identified the following as the major opportunities for bikeshare trips in the City:

- First-mile / Last-mile trips between the City of Falls Church and the nearby transit hubs of the East Falls Church and West Falls Church Metrorail stations, as well as the Seven Corners Transit Center.
- Leisure and retail oriented trips to businesses within the City's commercial corridor. These users would use bikeshare as a substitute for walking, public transit, and short-distance car trips.

To ensure that bikeshare achieves its full potential, coinciding with the role out of the program, the City of Falls Church could invest in the following:

- Providing safe and well-marked bicycle routes within and between the City of Falls Church and nearby destinations.
- Coordinating with neighboring jurisdictions to ensure that bikeshare stations at destinations like the East Falls Church Metrorail Station have adequate capacity to meet demand generated within the City.

- Incorporating wayfinding that assists bicyclists in navigating around the city and to nearby destinations.
- Promoting bikeshare among major residential complexes and businesses within the City.

Based on the market study findings, the study team identified a list of criteria to guide the planning of Capital Bikeshare in the City of Falls Church, along with recommendations for 19 possible station locations within the City of Falls Church and its immediate vicinity. Final location selections were grouped into four main categories:

- Primary Locations: 10 sites that should be implemented as part of the initial launch of bikeshare in the City of Falls Church. These locations are near or adjacent to important traffic generators.
- Secondary Locations: Sites that have some potential demand for bikeshare stations but for a variety of reasons are not a priority for initial implementation.
- Alternative Locations: Pairs of sites that are alternatives to one another.
- External Locations: Sites that are located outside the City boundary but would provide additional connections to the City's bikeshare network.

As a base scenario, the cost and ridership model assumes a 13 stations system, with 10 stations at the identified primary locations, and three additional stations to provide improved coverage in the City.

## COSTS

Table 1 and **Table 2** show the estimated capital and operating funds needed to achieve build-out at the 10 Primary Locations identified by the market study, along with three un-identified additional locations. Bikeshare will require funding to support new equipment, operations, and state-of-good-repair expenses. The cost of new equipment represents the largest budget item for the City of Falls Church's bikeshare system. The program will require $562,000 to purchase and install stations. For the five-year period from FY2018 through FY2022, the estimated average cost recovery from user revenue is 30 percent. Title sponsorships, station sponsorships and advertisement will provide additional revenues that can be used to help offset the cost of operating the system. Even with all those funding sources, the financial model predicts a need to cover an estimated 40 to 45 percent of operating costs through additional sources such as public or grant funding. Finally, as equipment ages, the City will need to set aside funding for state-of-good-repair (SGR) needs. For the first five years of the program, SGR costs are expected to be low however the City will need to be prepared for greater equipment and replacement costs over the long-term; for a 13 station system, state of good repair costs over the next 15 years would total approximately $1,000,000, with costs peaking 10-years after the system launches and then declining afterward

The final size of the system will impact the program cost recovery and amount of operating support needed to maintain the bike share program. **Table 3** shows how cost recovery from user fees, advertising, and sponsorships will vary based on system size.

**Table 1: New Capital Costs ($1,000s)**[1]

| | FY18 | FY19 | FY20 | FY21 | FY22 |
|---|---|---|---|---|---|
| # of New Stations | 10 | 3 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 18 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $104 | $0 | $0 | $0 |
| Installation Costs | $60 | $18 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Total** | **$440** | **$122** | **$0** | **$0** | **$0** |

**Table 2: Operating Cost Projections ($1,000s)**

| | FY18 | FY19 | FY20 | FY21 | FY22 |
|---|---|---|---|---|---|
| Annual Ridership (1,000s) | 2 | 7 | 9 | 9 | 10 |
| | | | | | |
| User Revenue | $14 | $62 | $71 | $72 | $77 |
| Advertising Revenue | $4 | $19 | $20 | $20 | $20 |
| Title Sponsorship | $7 | $27 | $27 | $27 | $27 |
| Station Sponsorship | $3 | $13 | $14 | $14 | $15 |
| **Operating Revenue Subtotal** | **$28** | **$121** | **$131** | **$132** | **$138** |
| | | | | | |
| Contractor Operating Costs | $35 | $182 | $195 | $200 | $206 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$214** | **$228** | **$235** | **$242** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 56% | 58% | 56% | 57% |
| **Operating Support Needed** | **$19** | **$93** | **$97** | **$102** | **$104** |

**Table 3: Operating Cost Recovery from User, Advertisement, and Sponsorship Revenue Based on System Size**

| Number of Stations | FY18 | FY19 | FY20 | FY21 | FY22 |
|---|---|---|---|---|---|
| 10 | 60% | 60% | 62% | 60% | 61% |
| 11 | 60% | 59% | 60% | 59% | 59% |
| 12 | 60% | 57% | 59% | 58% | 58% |
| 13 | 60% | 56% | 58% | 56% | 57% |
| 14 | 60% | 56% | 57% | 55% | 56% |
| 15 | 60% | 55% | 56% | 55% | 55% |
| 16 | 60% | 54% | 55% | 54% | 55% |

[1] Due to rounding, figures in table may not sum to value shown in total.

# Contents

**Tables & Figures**

# Introduction

Capital Bikeshare is one of the nation's largest bike-share programs. Capital Bikeshare is a regional transportation system with over 400 stations and three million daily riders. The system includes locations in neighboring Arlington and Fairfax Counties, along with the City of Alexandria, Washington, D.C. and Montgomery County. The City of Falls Church plans to join Capital Bikeshare to strengthen multimodal connections within the City, and to nearby destinations and the regional transit network. In 2016 the City was awarded $2 million in federal Regional Surface Transportation Program (RSTP) capital funds for bikeshare. In addition, the City is eligible for an additional $500,000 in operating funds through the I-66 Inside the Beltway multimodal solutions project.

The study consists of two components:

- A Market Study that highlights the locations with the greatest potential for bikeshare within the City of Falls Church. The goal of this study is to assist the City in determining the number and location of bikeshare stations.
- A Financial Plan that outlines the expected cost and revenues associated with the program.

# Market Analysis

The City's bikeshare system will provide community residents, employees, and visitors additional multimodal connections within the City and to the surrounding area. The purpose of this market analysis is to determine the areas within the City of Falls Church that have the greatest potential for bikeshare, and provide the City with input on the ideal overall size of the system and location of stations. The market study includes several components:

- A bikeshare propensity analysis based on 10 measures, to determine which areas of the City have the greatest demand for bikeshare.
- An inventory of key destinations within the City that could support bikeshare usage.
- Analysis of ridership in other parts of the Capital Bikeshare system and analysis of predicted user base of Capital Bikeshare in the City of Falls Church.

The market study will conclude with a list of planning criteria to guide the development of the system, along with identification of potential station locations.

## PROPENSITY ANALYSIS

In developing the market study, ten different geographic measures related to usage of bikeshare were mapped and analyzed (see **Table 4**). These measures capture a diverse range of factors that inform the City of Falls Church on the ability of the system to meet the City's bikeshare goals (see **Appendix A: Screening of Individual Measures** for more information on the individual measures).

**Table 4: Individual Market Study Measures**

| Measure |
|---|
| **A. Population density** |
| **B. Distribution of population under 150 percent of the federal poverty line (definition for low-income)** |
| **C. Employment density** |
| **D. Density of retail and hospitality employment (proxy for retail activity)** |
| **E. Density of bicycle commuters** |
| **F. Density of bicycle, walk, and transit commuters** |
| **G. Density of bicycle infrastructure** |
| **H. Density of points of interest** |
| **I. Density of parks** |
| **J. Change in elevation (average slope)** |

These measures have been aggregated into one propensity map (see **Figure 1**), which identifies the areas with the highest likelihood of generating bikeshare trips.

## Methodology

Each propensity map is composed of a series of measures that have been normalized to a scale of zero to one, with one representing the maximum value and zero the minimum value. The measures used in this analysis are largely based on absolute numbers (e.g., the number of bicycle commuters, or income population per square mile) instead of percentages (e.g., proportion of population that is low-income); a location for example may have 100 percent of its population below the poverty line, but still barely register under the low-income measure if its total population is negligible. This approach was taken so that each measure gauges the total population impacted by bikeshare. In scoring the maps, certain measures were provided with an additional weighting based on the perceived importance of that factor. **Table 5** outlines all the measures included in the study and associated weights. Population and employment density were assigned a higher weight than the other factors because they are the factors most significantly correlated with high bikeshare ridership.

**Table 5: Propensity Map Measure Weighting**

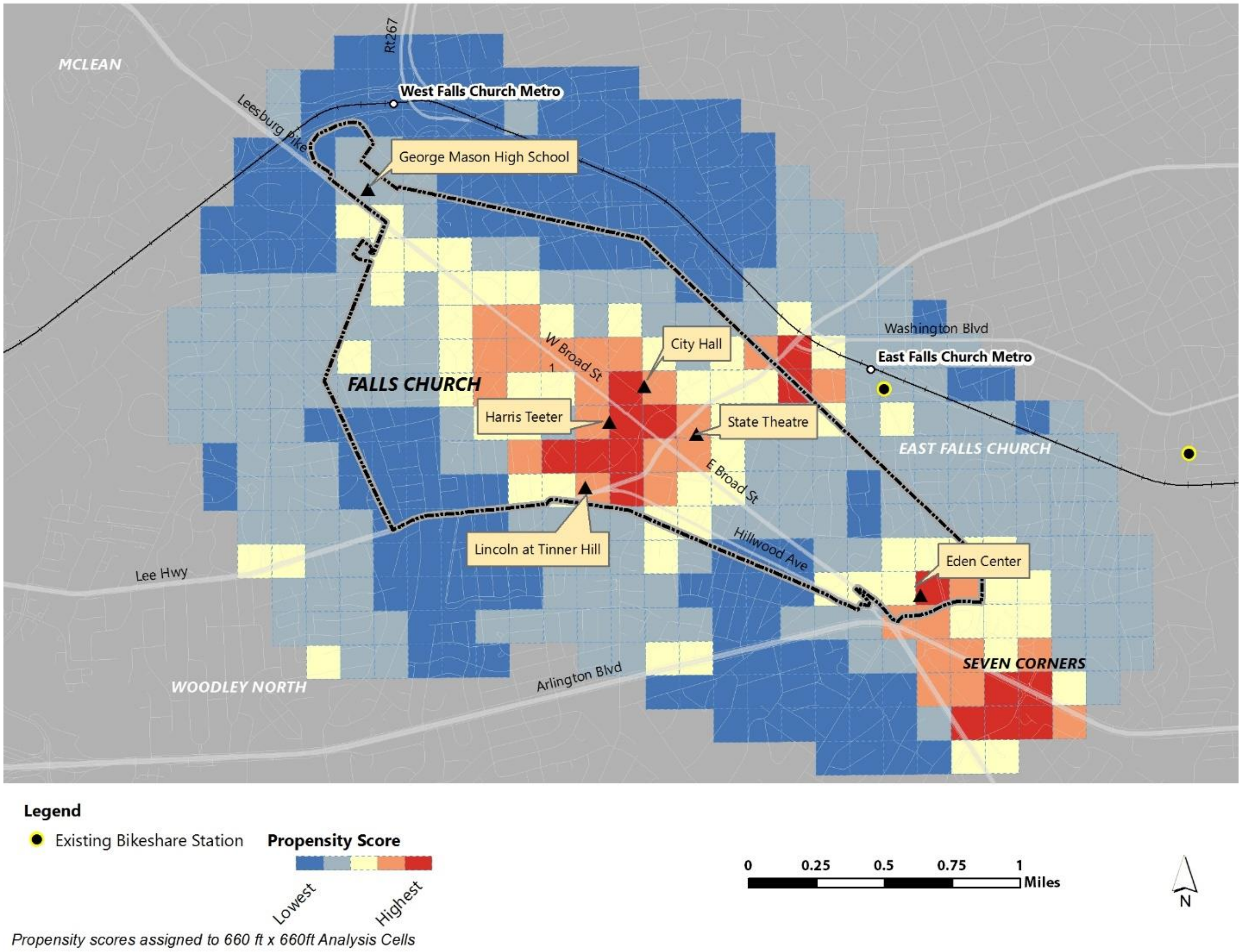
| Measure | Weighting by Measure |
|---|---|
| **A. Population density** | 2 |
| **B. Distribution of population under 150 percent of the federal poverty line (definition for low-income)** | 1 |
| **C. Employment density** | 2 |
| **D. Density of retail and hospitality employment (proxy for retail activity)** | 1 |
| **E. Density of bicycle commuters** | 1 |
| **F. Density of bicycle, walk, and transit commuters** | 1 |
| **G. Density of bicycle infrastructure** | 1 |
| **H. Density of points of interest** | 1 |
| **I. Density of parks** | 1 |
| **J. Change in elevation (average slope)** | 1 |

## Results

The propensity analysis (see **Figure 1**) highlights which areas within Falls Church and its immediate vicinity have comparatively the best conditions to support bikeshare. The grid cells received scores ranging from zero to 7.4, with a higher value reflecting a greater predicted demand for bikeshare. Overall the greatest demand overlaps closely with the City's two main commercial corridors of Broad Street and Washington Street. These corridors are home to the vast majority of retail and multi-family development within the City. Furthermore, key public services and amenities within the City are concentrated along these two corridors. While the City has an average population density of approximately 7,000 people per square mile, stretches of Broad Street and Washington Avenue have densities greater than 10,000 people per square mile; and these densities compare favorably to many of the urban areas currently served by Capital Bikeshare in the region.

The Seven Corners area is the second notable node of bikeshare demand. The area, which largely falls outside of the City boundary, is home to a busy bus transit hub, retail, and multi-family residential development. The Eden Center, located at the southern edge of the City, has one of the highest concentrations of Vietnamese-American stores and restaurants in the country. The lack of suitable bicycle infrastructure and high traffic volumes however make it a challenge to access Seven Corners from adjacent parts of Falls Church.

**Figure 1: Propensity Analysis Result for the City of Falls Church and immediate surrounding areas**




# KEY DESTINATIONS

The propensity analysis is only one data point used in determining the location of bikeshare stations. Factors like new development along Broad and Washington Streets, or the importance of the Metrorail stations in the City's mobility, are not reflected in the propensity analysis. Understanding the key destinations that drive transportation demand in the City is an important component in creating the final plan for bikeshare in Falls Church.

## Public Transportation

The City of Falls Church is currently served by two Metrorail stations: East Falls Church and West Falls Church VT/UVA. The East Falls Church station, located in Arlington County, is served by the Orange and

Silver lines, and the West Falls Church station, located in Fairfax County, is served by the Orange line. While both stations provide key access to Arlington County, Fairfax County, and other locations in the greater Washington D.C. Metropolitan area, the stations are 0.5 to 1.5 miles from destinations along the City's commercial corridors.

In addition to these two Metrorail stations, the Seven Corners Transit Center is located just south of the City at the intersection of Route 7 and Arlington Boulevard.

### Existing Bikeshare Connection

Riders who access a bike from a station in the City of Falls Church will be able to drop off the bike at any of the Capital Bikeshare stations in the region. The East Falls Church Metrorail station currently has a Capital Bikeshare station, which will enhance multimodal connections by allowing users to travel between the Metrorail station and the City via bikeshare. West Falls Church currently does not have a bikeshare station but Fairfax County has joined Capital Bikeshare and is in the process of adding stations in Tysons Corner and Reston.

### Infrastructure Improvement

While the propensity analysis considers existing bicycle infrastructure, there are a variety of proposed infrastructure improvements that would greatly enhance the bicycle and pedestrian environment between the City and the East Falls Church Metrorail station. Improvements include installing bike lanes parallel to Washington Boulevard between the East Falls Church border and Westover, building an additional entrance to the East Falls Church Metrorail Station, and constructing an overpass over Route 29, Lee Highway, for bicyclists using the W&OD regional trail.

## Mixed Use Development

Mixed-use development supports bikeshare by generating a diverse range of work and non-work trips across the entire day. The growing number of mixed-use developments within Falls Church will help drive demand for bikeshare in the City. As of the March 2017, there are a number of large existing and planned mixed-use developments, including:

- A cluster of development along West Broad Street from Oak Street to Virginia Avenue that includes four multi-family residential buildings, retail, and a hotel.
- The 301 West Broad development at West Broad Street and Little Falls Street which features apartments and retail, including a Harris Teeter supermarket.
- The Northgate development on North Washington Street between Columbia Street and Jefferson Street which includes retail and multifamily residential.
- The Pearson Square mixed use development at South Maple Avenue and Tinner Hill.
- Lincoln at Tinner Hill is a mixed-use development on South Maple Avenue, opening in 2017. The site has over 45,000 square feet of retail and 224 apartments. The site is located adjacent to South Washington Street, and is less than half a mile from the Broad Street and Washington Street intersection.

- Founder's Row (formerly known as Mason Row), at the intersection of West Broad Street and North West Street. This development will include over 62,000 square feet of retail, as much as 33,000 square feet for a movie theater, age-restricted housing, and 322 apartments. The site is located on Broad Street in the western end of the City's downtown corridor. The site is also located adjacent to the WO&D Regional Trail. As part of the voluntary concessions, the development will provide financial support for a bikeshare station in perpetuity.

### Civic Destinations

Bikeshare can be utilized to connect residents and visitors to civic destinations like parks, schools, libraries, and other public facilities. The following are key civic destinations to which Capital Bikeshare can help connect:

- City Hall
- Tinner Hill Historic Site
- The Mary Riley Styles Public Library
- Cherry Hill Park and the historic Cherry Hill Farmhouse
- George Mason High School and Mary Ellen Henderson Middle School
- Larry Graves Park
- State Theatre
- Creative Cauldron

### Retail Destinations

The City of Falls Church has a number of important retail destinations which could be served by bikeshare, including:

- Broad Street and Washington Street retail corridors.
- The Eden Center, which features one the largest concentrations of Vietnamese-American businesses in the nation.
- Strip-mall development along Route 7 at the western end of the City.

## PREDICTED USER BASE AND TRIP PATTERNS

Understanding who will ride Capital Bikeshare within Falls Church and how those riders will use the system, is another important factor in determining the size and shape of the City's bikeshare program. In order to estimate ridership within the City of Falls Church, the study looked at ridership rates of areas similar to Falls Church with existing Capital Bikeshare stations.

### Comparative Analysis within Existing Capital Bikeshare Network

The user base of the existing Capital Bikeshare network varies considerably depending on neighborhood and jurisdiction within the system. Over 80 percent of Capital Bikeshare trips are taken by regular users, riders who hold an annual or monthly subscription to the program. These users, referred to as Registered Users, tend to incorporate bikeshare as part of their daily travel patterns, such as, as their commute mode or a first mile/last mile connection to transit. Yet, within certain parts of the system such as the National Mall in Washington, D.C. or the Arlington National Cemetery, 50 percent or more of trips are taken by riders who do not hold a long-term membership, a group referred to as Casual Users. Casual Users utilize bikeshare for leisure, sightseeing, or recreation/exercise purposes.

To understand the potential user base of bikeshare within the City of Falls Church, travel patterns at existing Capital Bikeshare stations in similar suburban environments such as South Arlington, the Del Ray neighborhood of Alexandria, and the City of Rockville and City of Takoma Park in Montgomery County, Maryland were examined. As Arlington County has not completed adding stations to East Falls Church, that neighborhood was excluded from the analysis. Trip data from October 2015 to September 2016, the most recent 12-month period where detailed data is available, was analyzed. During this period, over 3 million trips were recorded on Capital Bikeshare. Trips that specifically originated in the predefined comparison area were isolated and key statistics by station were calculated including breakdown of trips by membership type, and daily trips per station per bicycle. As there is a high degree of seasonal variation in bikeshare ridership, the analysis categorizes ridership by two seasons, with the peak season (April to October) and off-peak season (November to March).

City of Falls Church peer comparison areas have lower rates of usage than the system-wide station average. Moreover, when ridership is examined on a seasonal basis, three of these four comparison areas also see a greater proportional drop in ridership during the winter months than the system-wide average. Finally, these areas have a rate of registered users vs. casual users that is consistent with the system-wide average.

The lower ridership rates are largely due to the comparison areas having lower population densities and more auto-oriented development patterns than the highest ridership stations in the Capital Bikeshare system. Like as in Falls Church, these comparison areas see higher rates of driving, and lower rates of transit use and walking compared to the urban core of the Washington region.

**Table 6: Ridership Statistics for Comparison Areas within the Capital Bikeshare Network.**

| | Daily Trips per Bicycle (April to October) | Daily Trips per Bicycle (November to March) | Percent of Trips by Registered Users |
|---|---|---|---|
| Rockville, MD | 0.23 | 0.05 | 75% |
| Tacoma Park, MD | 0.57 | 0.18 | 91% |
| South Arlington | 0.63 | 0.14 | 80% |
| Del Ray, Alexandria, VA | 0.88 | 0.17 | 86% |
| **System-wide** | **2.93** | **0.75** | **84%** |

## Target Market for Bikeshare in the City of Falls Church

Based on the characteristics of the City of Falls Church, and the profile of comparison areas within the existing Capital Bikeshare network, it is likely that bikeshare will be used predominately by registered users in the City of Falls Church at rates that below the system-wide average

Most of the bikeshare trips in the City will be:

- First-mile / Last-mile trips between the City of Falls Church and the nearby transit hubs of East Falls Church and West Falls Church Metrorail station, along with the Seven Corners Transit Center.
- Leisure and retail oriented trips to businesses within the City's commercial corridor. Users would use bikeshare as a substitute for walking, public transit, and short-distance car trips.

A smaller proportion of demand could be generated by:

- Recreational trips, most notably along the WO&D trail.
- Bikeshare trips substituting existing trips taken on Metrorail or automobile to access the Rosslyn/Ballston corridor from the City of Falls Church. Due to the distance between the City of Falls Church and the major job centers in Arlington County, bikeshare will only be able to capture a small share of these trips.

### Ensuring Needs of Target Market are Met

The large decline in bikeshare ridership during the winter months in places like South Arlington and Rockville, highlight an important characteristic of bikeshare in a suburban market like the City of Falls Church: that bikeshare demand in suburban areas is more elastic than the urban core; in these markets users have other alternatives to bicycling. For bikeshare to reach its full potential in the City of Falls Church, users will need to perceive the program as a safe, convenient, and comfortable mode of transportation. Details will matter when implementing Capital Bikeshare in the City, including:

- Providing safe and well-marked bicycle routes within and between the City of Falls Church and nearby destinations.
- Coordinating with neighboring jurisdictions to ensure that bikeshare stations at destinations like the East Falls Church Metrorail Station have adequate capacity to meet demand generated within the City.
- Incorporating wayfinding that assists bicyclists in navigating around the city and to nearby destinations.
- Promoting bikeshare among major residential complexes and businesses within the City.

## RECOMMENDATIONS

Based on the findings from the market study, Foursquare staff has identified a list of criteria to guide planning of Capital Bikeshare in the City of Falls Church, as well as recommendations for station locations in the City. The market study found that bikeshare demand is concentrated within the City's main corridors of Washington Street and Broad Street. The system will be used as a mode of transportation by residents, workers and visitors, and will serve as more than simply a recreational amenity. Bikeshare can play a role in reducing automobile dependency by adding to the available transportation alternatives such as existing car-share and transit options.

## Planning Criteria to Guide Station Siting

Station siting will play an important role in determining the effectiveness of bikeshare in the City of Falls Church. Bikeshare functions as a network and the placement and density of stations closely impact ridership. The following are key criteria that the consultant team identified as important in determining station location:

- **Density**: The density of bikeshare stations is important for two key reasons. First, providing stations close together reduces the average time it takes a rider to walk to or from a station. A quarter mile is considered a typical walking radius for bike share stations. Denser stations also increase the total number of destinations accessible by bicycle. Ridership grows as the number of destinations within a bike-able distance increase. When determining the density, it is also true that too great of a station density can result in higher operating and capital costs for the program. <u>In summary, it is recommended that bikeshare stations be placed no farther than half a mile apart from another station, with a target density of one station every quarter mile along the key commercial corridors of Broad Street and Washington Street.</u>
- **Station Size**: Bikeshare stations can be purchased with a varying number of docks, with the ability to expand stations in the future. Optimizing station sizing is important for the function of a bikeshare station; purchasing too small of a station can result in capacity constraints while too large of a station results in unnecessary additional cost. <u>It is recommended that City utilize smaller stations of 11 to 15 docks in most locations.</u> If demand exceeds supply, stations can be expanded over time with additional docks.
- **Maintain Capacity at Key Locations:** A large proportion of users will likely utilize bikeshare to access destinations outside of the City. Falls Church should closely monitor usage at stations such as the East Falls Church Metro station, as capacity constraints at nearby Metro stations will have a large impact on Falls Church based trips.
- **Visibility and Proximity to Destinations**: Stations should be placed in locations that are easily accessible to nearby destinations. When possible, stations should have a clear line of sight from the entrance to facilities such as Metrorail stations, key points of interest, and major real estate developments.
- **Accessible to Key Bicycle Routes:** While stations should not be sited solely based on the availability of bicycle infrastructure, stations should be placed in locations that are easily accessible from key bicycle routes. Maple, Park, and Hillwood Avenues are especially important bicycle routes, as they provide an alternative from the busy arterials of Washington and Broad Street.

## Station Location Recommendations

The study team has identified a total of 19 potential station locations, including two locations that are alternatives to one another. The 19 locations can be farther divided into four categories:

- Primary Locations: Sites that should be implemented in the short-term of bikeshare's launch in the City of Falls Church. These locations are near or adjacent to important traffic generators.
- Secondary Locations: Sites that have some potential demand for bikeshare stations but for a variety of reasons are not a priority for initial implementation.
- Alternative Locations: Sites that are alternatives to one-another.
- External Locations: Sites that are outside the borders of the City but would provide additional connections to Falls Church's bikeshare network.

These station locations reflect the findings of the market analysis, including the propensity analysis and other factors documented in this chapter. Stations are placed so that riders can utilize bicycle-friendly corridors such as Maple, Park, and Hillwood Avenues. Implementing bikeshare at the ten primary station locations will yield a citywide density of five stations per square mile, a level that compares favorably to Capital Bikeshare's overall average station density.

**Figure 2** and **Table 7** provide the location and justification behind the proposed station locations. The final location of bikeshare stations will likely vary depending on factors such as the status of future real estate developments, community feedback, and the availability of space for a bikeshare station.

**Figure 2: Potential Station Locations**

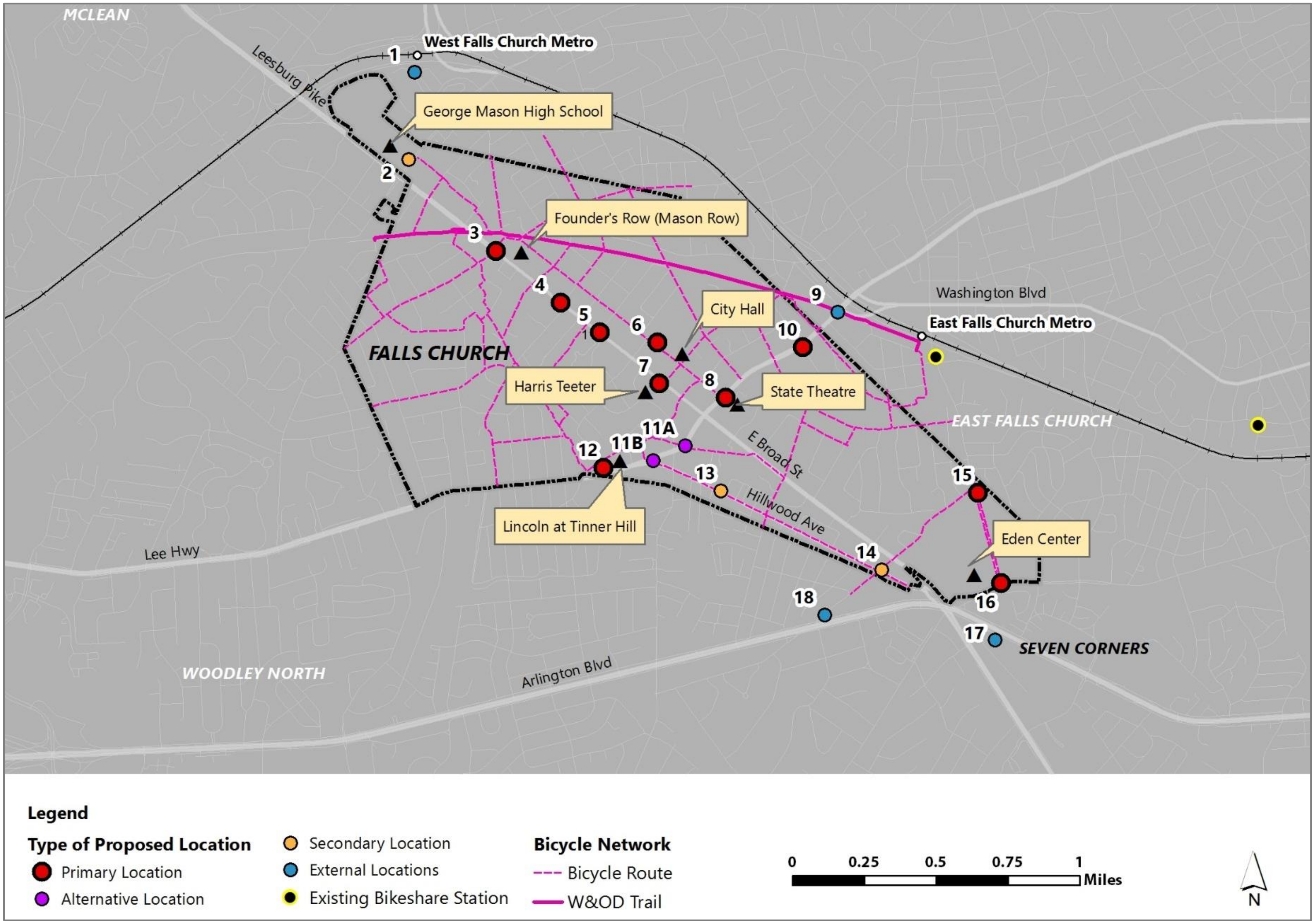


**Table 7: Proposed Station Locations and Justification**

| Number | Location | Justification / Details |
|---|---|---|
| 1 | West Falls Church Station | This site would enable Falls Church residents to access both nearby Metrorail stations by bikeshare. The site is outside of the City and would require cooperation with Fairfax County and WMATA. |
| 2 | Leesburg Pike @ Haycock Road | Serves the George Mason High School and adjacent retail development. Considered a secondary location as it lacks good bicycle access to the core of the City. |
| 3 | Broad Street @ West Street | Serves the planned Mason Row mixed-use development, as well as provide a linkage to the WO&D trial. |
| 4 | Broad Street @ Oak Street | Serves mixed-use and hotel development along Broad Street. Station should be located on the north side of the street to enable easy connections to Park Avenue. |
| 5 | Broad Street @ Pennsylvania Avenue | Serves mixed-use development along Broad Street. Station should be located on the north side of the street to enable easy connections to Park Avenue. |
| 6 | Park Avenue @ Virginia Avenue | This site would serve the public library, City Hall, and Cherry Hill Park. |
| 7 | Broad Street @ Little Falls Street | Serves the Broad Street commercial corridor, including the new mixed-use West Broad development. |
| 8 | Washington Street @ Park Avenue | Serves the heart of Falls Church, including destinations at Broad and Washington Street, the State Theater, and Kaiser Permanente Medical Center. It is recommended that the station be located on the west side of Washington to maximize access to Park and Maple Avenue. |
| 9 | Washington Street @ Westmoreland | Provides access to the WO&D trail, as well as surrounding mixed-use development. Would require cooperation with Arlington County. |
| 10 | Washington Street @ Jefferson Street | Serves the northern end of Washington Street, including the large Northgate mixed-use development. |
| 11A | Washington Street @ Fairfax Street | Before the completion of the Intermodal Transportation Center, this site could be the temporary home of a bikeshare station. |
| 11B | Intermodal Transportation Center | Station 13A could be relocated to the site of the Intermodal Transportation Center once it is completed (expected completion date between 2018 and 2020). |
| 12 | Maple Avenue @ Washington Street | Serves the adjacent Pearson Square and Lincoln at Tinner Hill developments at the southern gateway to Falls Church. |

| Number | Location | Justification / Details |
|---|---|---|
| 13 | Hillwood Avenue @ Larry Graves Park | Serves to connect the residential area between Seven Corners and Washington Street. Categorized as a secondary location as there are few nearby destinations other than the Park and adjacent townhouse development. |
| 14 | Hillwood Avenue @ South Street | Provides access to office and retail development west of Route 7. Categorized as a secondary location because of its distance from other bikeshare stations and the challenges posed by cycling across Route 7, or Arlington Boulevard. |
| 15 | Roosevelt Boulevard @ Roosevelt Street | Serves the Oakwood Apartment and Roosevelt Towers. This location also acts as a linkage halfway between the East Falls Church Metro and Seven Corners. |
| 16 | Eden Center | Serves the busy Eden Center shopping complex and provides bikeshare access to the large multi-family housing development located south of Wilson Boulevard. |
| 17 | Seven Corners Transit Center | Connects Falls Church to the Seven Corners Transit Center. The busy Seven Corners intersection poses a significant barrier to cyclists. As the site is outside the City boundary, Falls Church would need to work with Fairfax County to have the station installed. |
| 18 | South Street @ Arlington Boulevard (Loren) | This location would serve the mixed-use Loren development on Arlington Boulevard. The site is outside of the City and would require cooperation with Fairfax County. |

# Financial Plan

The financial plan was developed to provide Falls Church a data driven understanding of Capital Bikeshare's future operating and capital costs. The results of the financial analysis will help the City to determine its funding needs and begin to prepare for future financial liabilities including maintenance and upkeep of the system.

This financial plan assumes a system consisting of 13 stations, 10 of which will be installed in the Spring of 2018, and another 3 installed in the Fall of 2018. Bikeshare costs can be divided into capital and operating expenses. The capital budget covers any expenses for equipment, parts, site planning, and installation costs. The operating budget represents costs incurred by the operator to provide bike share services and routine maintenance expenditures. The financial figures here represent year of expenditure dollars and account for cost inflation of three percent per year. Figures are all a forecasted estimate and the final financial outlook may look very different based on the terms of future funding agreements and operating contracts.

## FINANCIAL MODEL ASSUMPTIONS

A five-year financial model was used to forecast the revenues, costs, and ridership associated with the City of Falls Church bikeshare system. The model is based on the existing cost structure of Capital Bikeshare and makes a number of assumptions to create a projection. It identifies current operating and capital costs and applies industry price increases and standard inflation rates to the current operating system. Various factors can be adjusted, including the number of stations, docks, bicycles, and ridership, to determine potential system costs. FY18 is the first year of the five-year forecast, with the first stations slated to be installed in the April 2018.

Future operating costs were projected using a generic operating fee of $98 per dock per month, plus an annual administrative fee of $18,750 and annual marketing fee of $12,500[2]. The most recent contract with Capital Bikeshare's operator, Motivate Co., shows a decreasing trend in operating costs per dock per month; costs decreased by more than 15 percent from 2016 to 2017. Annual administrative and marketing fees are based on Arlington County's 2016 expenditures. These costs were then projected out over the next six years using an operating cost increase of three percent per year to create a baseline measure.

The model assumes that Falls Church will install 13 stations consisting of 78 bicycles and 156 docks (12 docks at each station); 10 station will be installed in April 2018, with the remaining three installed by October 2018.

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[2] Based on Arlington County projected operating costs, normalized by number of stations to account for large difference in system size.

Capital costs are based on the current approximate price of a 12-dock station ($33,000). Capital costs also include installation and site planning costs, replacement bicycles, and account for the lifespan of both the bicycles and the stations. The cost model also estimates that one percent of bicycles will require replacement due to damage, theft, or vandalism. The cost model assumes a three percent annual capital cost increase, which is used to adjust the costs over the planning horizon. The model's assumptions for vandalism and capital cost increases are higher than observed rates in other Capital Bikeshare jurisdictions to be conservative. Finally, the capital cost captures miscellaneous start-up costs charged by the vendor to initiative operations; these costs include a wide variety of expenses such as changes to the Capital Bikeshare website and payment platform, staffing equipment costs, spare parts, and liability coverage for initial program launch.

Ridership is estimated based on the number of trips per bike per day observed within the comparison area outlined in the market analysis on **page 6**: 0.5 trips per bicycle per day between April and October, and 0.11 trips per bicycle per day during the off-peak months of November to March. Future user revenue is projected based on:

- An average revenue of $85 per annual or monthly member and $8 per 24 hour/72 hour members; advertising revenue ($125 per station per month); usage fees per trip ($0.06 for registered members and $2.00 for casual members);
- Current ridership levels for both registered and casual members (90 trips per registered member and 2.5 trips per short-term member, respectively);
- The proportion of Capital Bikeshare's regional profit that Falls Church is likely to receive based on current resident membership ($300 per dock per year)[3]; and,
- A four percent ridership growth rate, user revenue is projected out five years to create a baseline estimate.

While Capital Bikeshare currently does not have a title sponsor, the member jurisdictions are actively pursuing a major sponsor for the program. The model includes a conservative title sponsor valuation of $8 million dollars, distributed over five years[4]. As Falls Church will account for roughly one percent of docks within the system, the model values the title sponsorship at $27,000 in annual revenue. Projections also include $13,000 in annual revenue from station sponsorship because of the City's current agreement with Mason Row developers.

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3

4 Major recent sponsorship agreements differ widely in value. Recent examples of major bikeshare sponsorships include Philadelphia's $8.5 million title sponsorship with Independence Blue Cross and Chicago's $12.5 million title sponsorship with Blue Cross and Blue Shield of Illinois.

# CAPITAL COSTS

## Cost of New Capital

The City of Falls Church has $2,000,000 in RSTP (Regional Surface Transportation Program) federal funding to fund the capital costs of bike share. Implementing a thirteen-station system will cost the City $562,000 in procurement and installation costs (**Table 8**). Appendix 3 highlights the cost funding an 11-, 12-, 13-, 14-, 15-, and 16-station system.

**Table 8: New Capital Costs ($1,000s)**

| | FY18 | FY19 | FY20 | FY21 | FY22 |
|---|---|---|---|---|---|
| # of New Stations | 10 | 3 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 18 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $104 | $0 | $0 | $0 |
| Installation Costs | $60 | $18 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Total Cost** | $440 | $122 | $0 | $0 | $0 |

*rounding may result in the sum of columns differing from the total value.

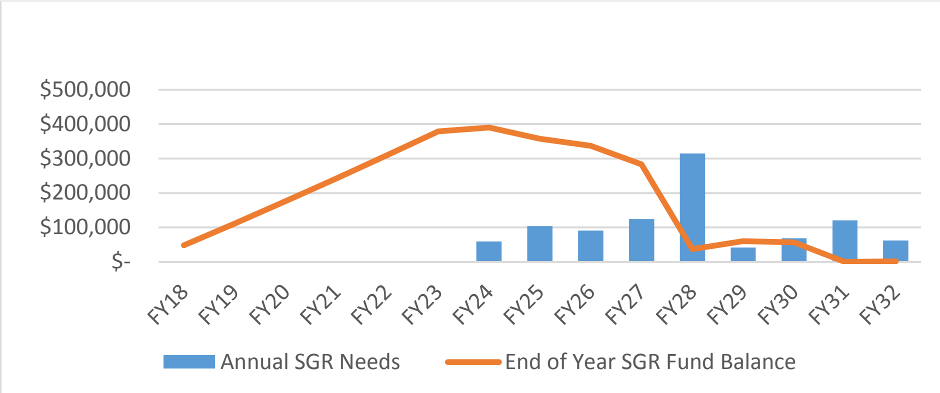
## State of Good Repair

State-of-Good-Repair (SGR) costs represent future capital needs for which the City of Falls Church will need to fund to keep the system in working operation. The annual SGR needs were forecasted over the next 15 years to fully capture the life cycle cost of equipment replacement. The model assumes that as equipment ages, a growing number of stations and bicycles will require replacement.

During the five-year scope of this plan, SGR costs will remain low, as the main cost driver will be replacing bicycles lost due to damage, vandalism, and theft. Bicycles are expected to require replacement between six and eight years of age, while stations are expected to need replacement between eight and eleven years of age. Major SGR costs will begin in FY24 and are expected to peak in FY28 when the largest proportion of stations will require replacement.

The City has two options for funding equipment replacement costs. The first is a pay-as-you-go approach where the City will need to secure funding in any given year to pay for its SGR liability. The second is to annualize these expenditures, putting away a fixed amount of funding in a capital reserve account used to cover future costs. To cover future SGR costs fully over the next 15 years, the City of Falls Church would need to commit an approximate $5,000 dollars per station each year to an interest-bearing reserve fund. **Figure 3** illustrates the SGR needs per year as well as the cumulative funding balance of a capital reserve fund.

**Figure 3: State of Good Repair (SGR) Needs and Recommended Capital Reserves[5]**



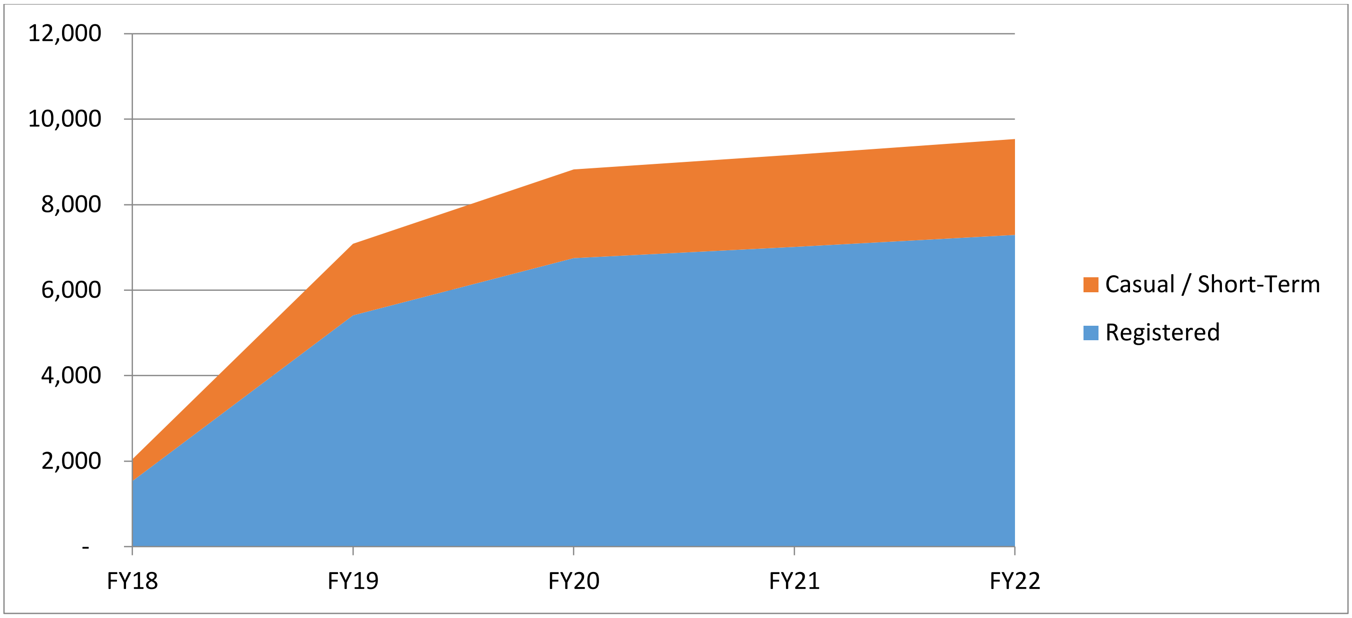

## OPERATING COSTS

The operating budget forecasts indicated that cost recovery from operating revenue will remain relatively steady (around 58 percent) between FY2018 and FY2023. Operating revenue includes the return from the user fees, the title sponsorship, station sponsorship, and station advertising.

After the system's initial rollout in the Spring of 2018, ridership growth will be driven by the natural growth in bikeshare usage over time of four percent per year (**Figure 4**).

[5] The SGR fund balance represents the minimum balance necessary to cover capital costs over the 15-year lifecycle of equipment if a steady amount of funding is set-aside each year.

**Figure 4: Forecasted Ridership by Year and Member Type**




The program is expected to yield an operating deficit in each year of the study (**Figure 5** and

Table 9) that will need to be covered through sources such as the $500,000 grant from Northern Virginia Transportation Commission, part of the I-66 Inside the Beltway multi-modal project. The absolute value of this shortfall will total approximately $414,000 between FY2018 and FY2022, if advertising and sponsorship revenue is fully realized.

See appendix 3 for a forecast of operating costs associated with an 11-, 12-, 13-, 14-, 15- and 16-station system. Cost recovery is expected to go down as system size grows.

**Figure 5: Operating Revenue, Cost, and State of Good Repair Set Aside Needs ($1000s)**

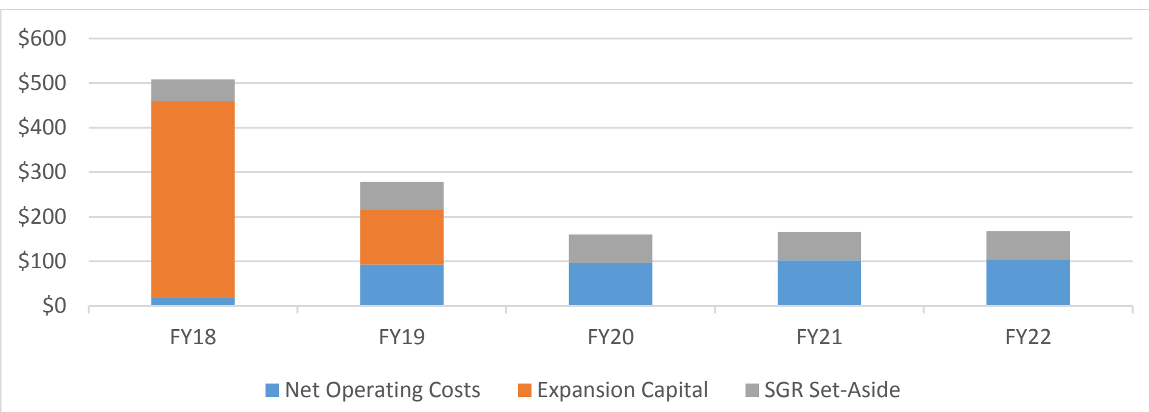


**Table 9: Operating Cost Projections (1,000s)**

| | FY18 | FY19 | FY20 | FY21 | FY22 |
|---|---|---|---|---|---|
| **Annual Ridership (1,000s)** | 2 | 7 | 9 | 9 | 10 |
| | | | | | |
| User Revenue | $14 | $62 | $71 | $72 | $77 |
| Regional Revenue Transfer | $9 | $44 | $48 | $47 | $50 |
| Memberships | $4 | $13 | $17 | $18 | $20 |
| *Registered* | $2 | $6 | $8 | $9 | $10 |
| *Casual* | $2 | $7 | $9 | $9 | $10 |
| Usage Fees | $1 | $5 | $6 | $6 | $7 |
| *Registered* | $0 | $0 | $1 | $1 | $1 |
| *Casual* | $1 | $4 | $6 | $6 | $6 |
| Advertising Revenue | $4 | $19 | $20 | $20 | $20 |
| Title Sponsorship | $7 | $27 | $27 | $27 | $27 |
| Station Sponsorship | $3 | $13 | $14 | $14 | $15 |
| **Operating Revenue Subtotal** | **$28** | **$121** | **$131** | **$132** | **$138** |
| | | | | | |
| Contractor Operating Costs | $35 | $182 | $195 | $200 | $206 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$214** | **$228** | **$235** | **$242** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 56% | 58% | 56% | 57% |
| **Operating Support Needs** | **$19** | **$93** | **$97** | **$102** | **$104** |

*rounding may result in the sum of columns differing from the total value.

## Funding Needs

The City of Falls Church's fundraising needs are broken into operating and capital needs as expenses in each category are eligible for different sources of funding. The City of Falls Church will need to secure $414,000 to operate the system over the next five years after forecasted direct-revenue sources are taken into account (user fees, sponsorships, advertising. If the City is not able to secure advertising and title sponsorship revenue, the funding gap will increase to $610,000 over the next five-years.

Capital fundraising needs vary considerably based on whether the city decides to fund only current year capital needs or set aside funds at a consistent rate for future capital needs. Over the next five years, the program is expected to incur $567,000 in capital costs. If the City chooses to set aside funds in a state of good repair fund to cover capital depreciation, an additional $300,000 will be required.

**Table 10: Fundraising Needs Between FY18 and FY22 ($1,000s)**

| | FY18 | FY19 | FY20 | FY21 | FY22 | 5-Year Total |
|---|---|---|---|---|---|---|
| **Operating Funding Needs** | | | | | | |
| Fundraising Need (before estimated advertising and title sponsorship revenue) | $29 | $139 | $143 | $149 | $150 | $610 |
| Fundraising Need (after estimated advertising and title sponsorship revenue) | $19 | $93 | $97 | $102 | $104 | $414 |
| **Capital Funding Needs** | | | | | | |
| Current Year Capital Needs | $441 | $123 | $1 | $1 | $1 | $567 |
| Current Year Capital Needs and Annualized Future Capital Needs | $489 | $186 | $63 | $63 | $63 | $865 |

*rounding may result in the sum of columns differing from the total value.

The city has a wide range of options to fill the funding gap identified in this financial plan. The City already has one station sponsorship agreement with Founder's Row (Formerly known as Mason Row). As the City continues to grow with several large-scale redevelopment projects, there are opportunities to work with developers to fund bikeshare as a traffic demand management approach

The projected capital and operating funding needs could be met through existing funds that the City has secured for bikeshare, including a $2 million RSTP grant for capital and $500,000 in operating support from NVTC as part of the I-66 Inside the Beltway project. Additional growth in the system will require additional operating support as NVTC operating funds will be largely exhausted after six years of operating a 13 station system.

## Funding Uncertainties

The financial model is based on several assumptions. The total net cost of operating Capital Bikeshare may increase or decline for a number of reasons, many of which are outside The City of Falls Church's direct control. Some key funding uncertainties include:

- The financial model includes an assumption that the region will successfully procure a title sponsor to support the program. Depending on the success of this effort, the total amount of funding available to the City of Falls Church can vary considerably from the estimate of $27,000 per year outlined here in this study.
- The bikeshare equipment market is very dynamic. Additional competition, as well as large-scale industry consolidation will have a major impact on the cost of future equipment. The model bases replacement equipment costs on current costs; however there has been some downward movement in equipment costs that may continue.

- The City of Falls Church as a member of Capital Bikeshare will benefit from the existing revenue sharing agreement between jurisdictions. Currently, membership revenue that cannot be debited to particular member is distributed based proportionally on the number of docks in each jurisdiction. A significant expansion of the program in another jurisdiction could negatively impact The City's share of revenue. Likewise, the revenue sharing agreement may change over time to The City's benefit or detriment.
- Bikeshare ridership is impacted by weather. An unseasonably cold winter or rainy summer could impact system performance.

# APPENDIX A: SCREENING OF INDIVIDUAL MEASURES

The following section outlines the results of the propensity mapping exercise conducted as part of the Market Analysis. Each of the ten individual measures mapped are factors intended to identify areas with the greatest potential for bikeshare. In these maps the relevant data has been aggregated to a grid of 1/8th X 1/8th mile cells.

## Measure A: Population Density

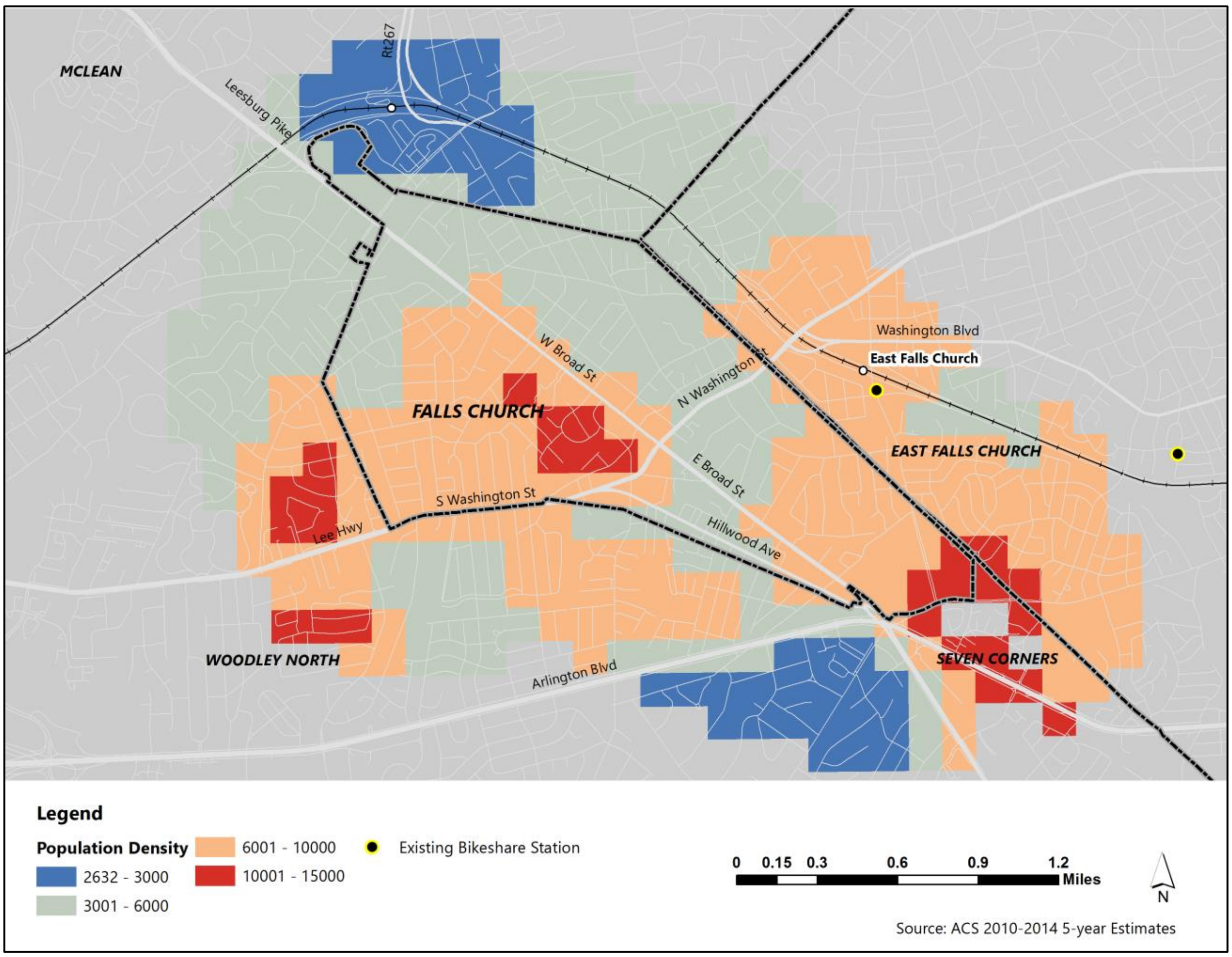
### Methodology

This map displays population density at the Census Block Group level from the U.S. Census Bureau, American Community Survey (ACS), 2010-2014 5-Year Estimates. Density calculated by translating the population count by census block group into a per square mile figure.

### Source

- U.S. Census Bureau, American Community Survey, 2010-2014, 5-Year estimates, Table B02001.

**Figure 6: Population Density (people / square mile)**



## Measure B: Low Income Populations

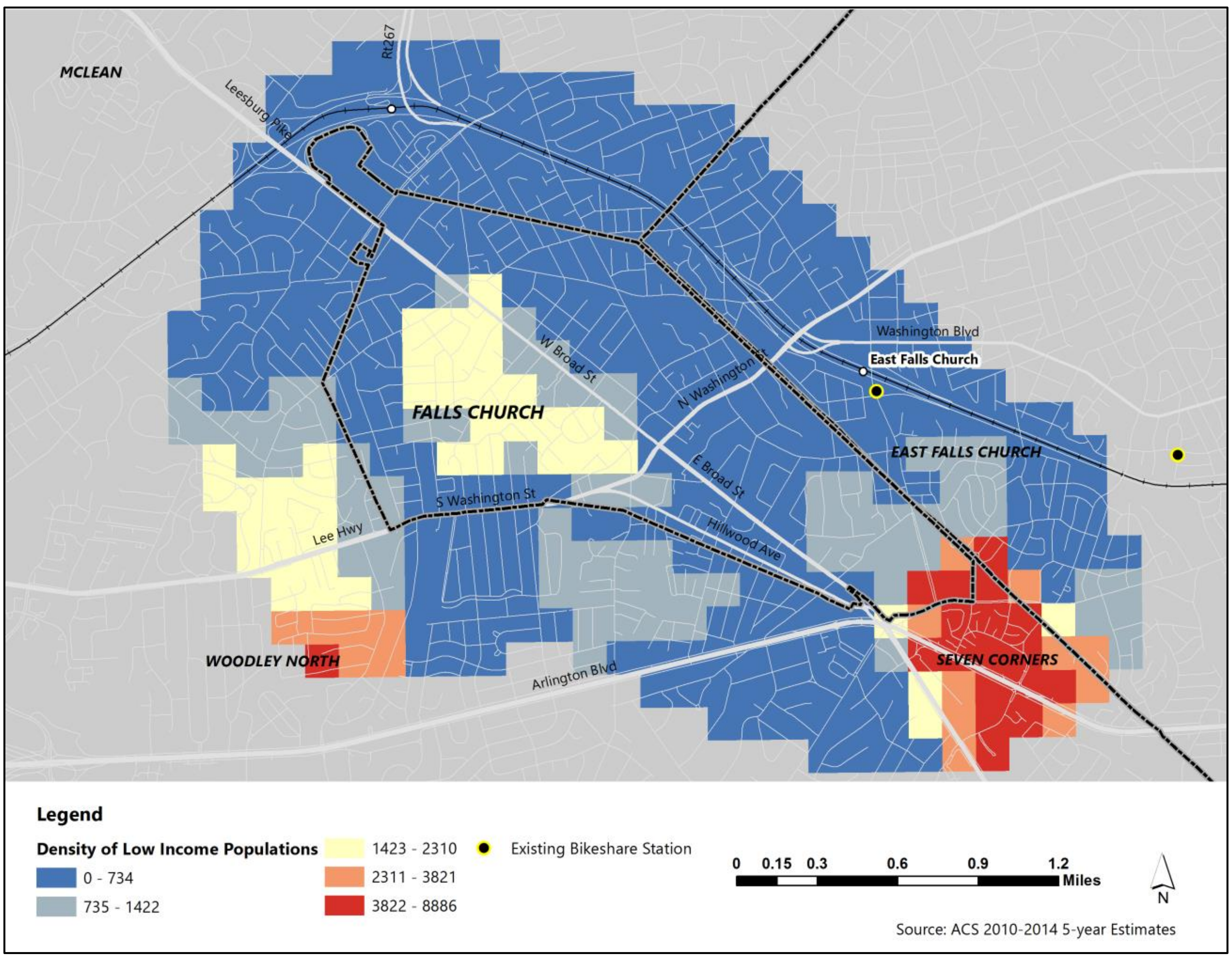
### Methodology

Data used was Table C17002 Ratio of Income to Poverty Level in the Past 12 Months, U.S. Census Bureau, American Community Survey (ACS), 2010-2014 5-Year Estimates that was joined to Census Block Groups. Low income is defined as the population in households making 200% or less of the federal poverty line. Density calculated is calculated by taking the total low-income population in each Block Group and translating it to a per square mile density.

### Source

- U.S. Census Bureau, American Community Survey (ACS), 2010-2014, 5-Year estimates, Table C17002.

**Figure 7: Density of Low Income Populations (people / square mile)**



## Measure C: Employment Density

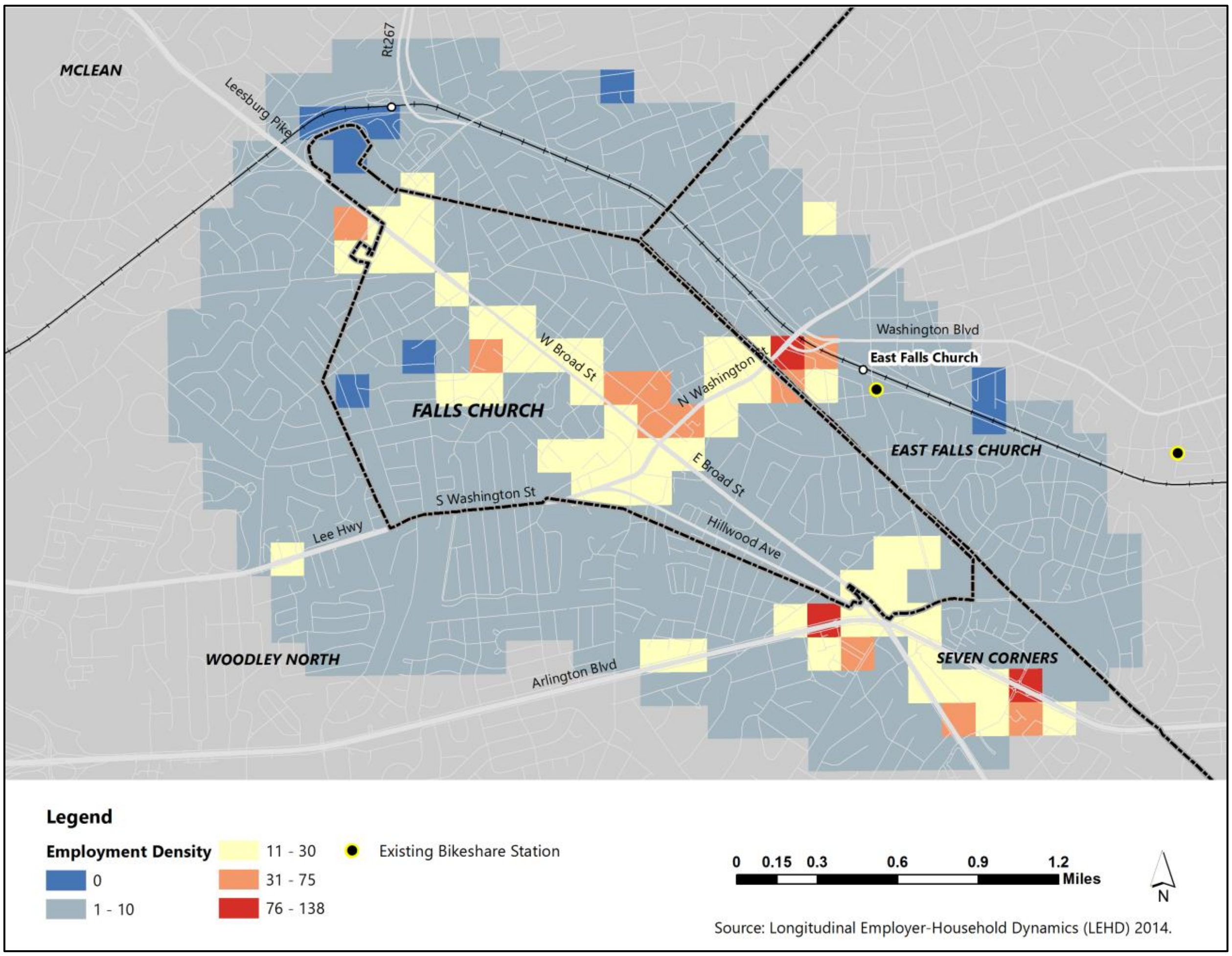
### Methodology

This map is based on the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) data. The employment count for all industries is aggregated to the Census Block Level. Densities are displayed as jobs per acre. It should be noted that the most recent employment data dates from 2014 and does not reflect some recent commercial development in the City.

### Source

- U.S. Census Bureau, LEHD, 2014.

**Figure 8: Employment per Acre**



## Measure D: Retail and Hospitality Employment Density

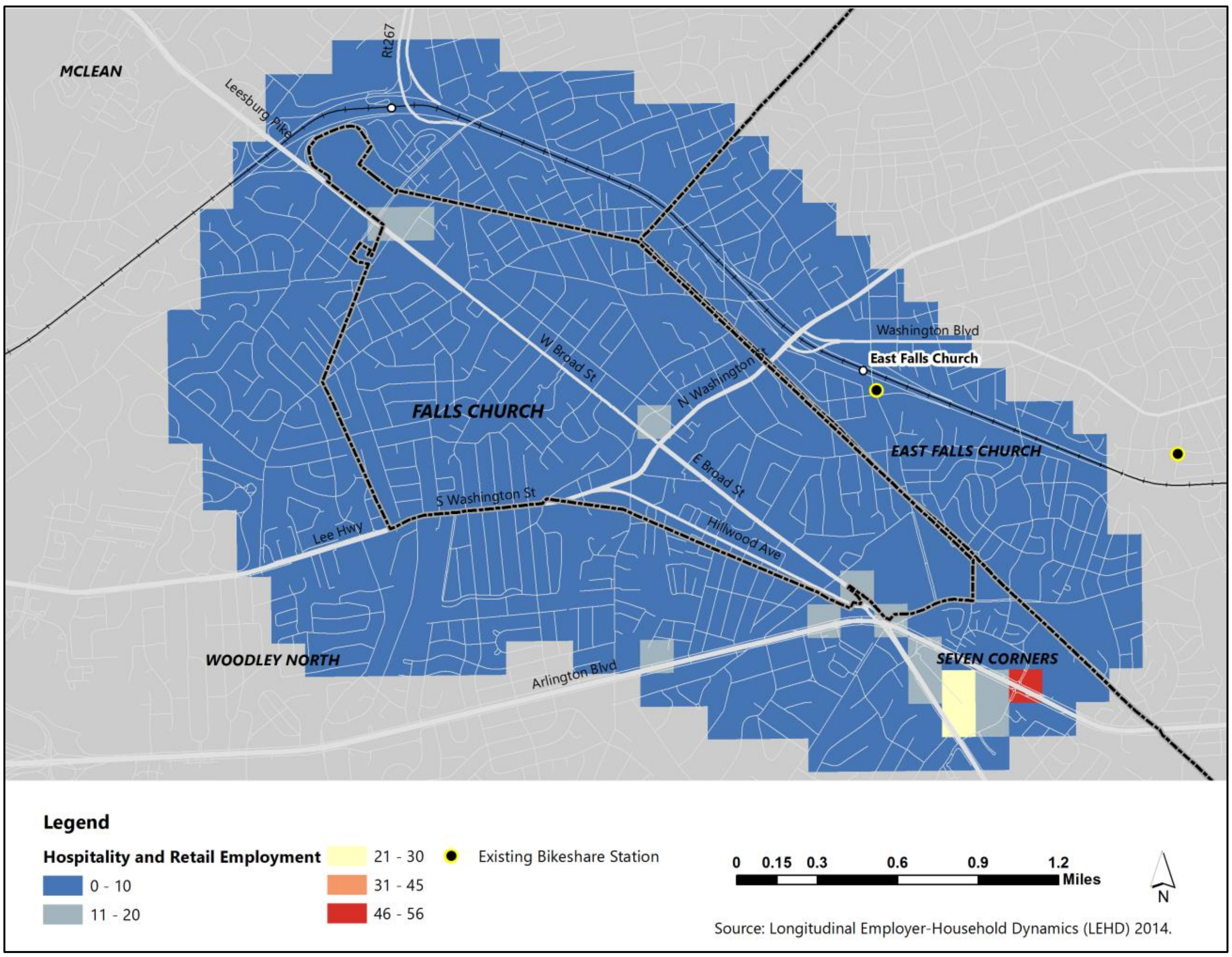
### Methodology

This map is based on employment data from the U.S. Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) data. The data includes all jobs in the hospitality and retail industries, including primary and non-primary jobs. The information is aggregated to the Census Block Group Level. It should be noted that the most recent employment data dates from 2014 and does not reflect some recent commercial development in the City.

### Source

- U.S. Census Bureau, LEHD, 2014.

**Figure 9: Retail and Hospitality Jobs per Acre**



## Measure E: Density of Bicycle Commuters

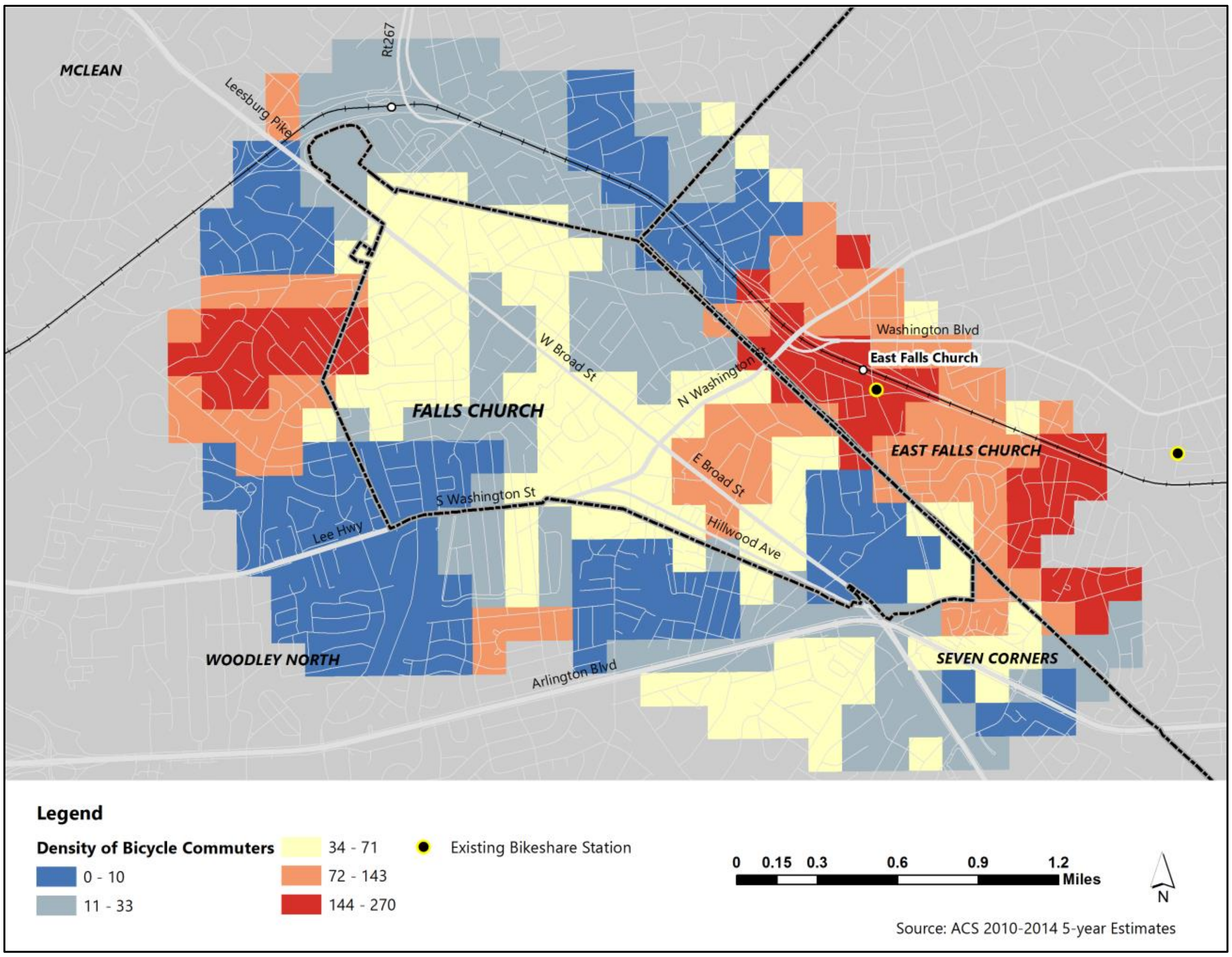
### Methodology

This map displays bicycle commuter density at the Census Block Group level from the U.S. Census Bureau's American Community Survey (ACS), 2010-2014 5-Year Estimates. The map shows the absolute number of bicycle commuters as opposed to the percent of bicycle commuters among all commuters. This method ensures that areas with a proportionally high number of bicycle commuters but an overall small commuting population are not overemphasized. The density is calculated by translating the total number of bicycle commuters in a Block Group to a per square mile figure.

### Source

- U.S. Census Bureau, American Community Survey, 2010-2014, 5-Year estimates, Table B08301.

**Figure 10: Density of Bicycle Commuters per Square Mile**



## Measure F: Density of Bicycle, Walk, and Transit Commuters

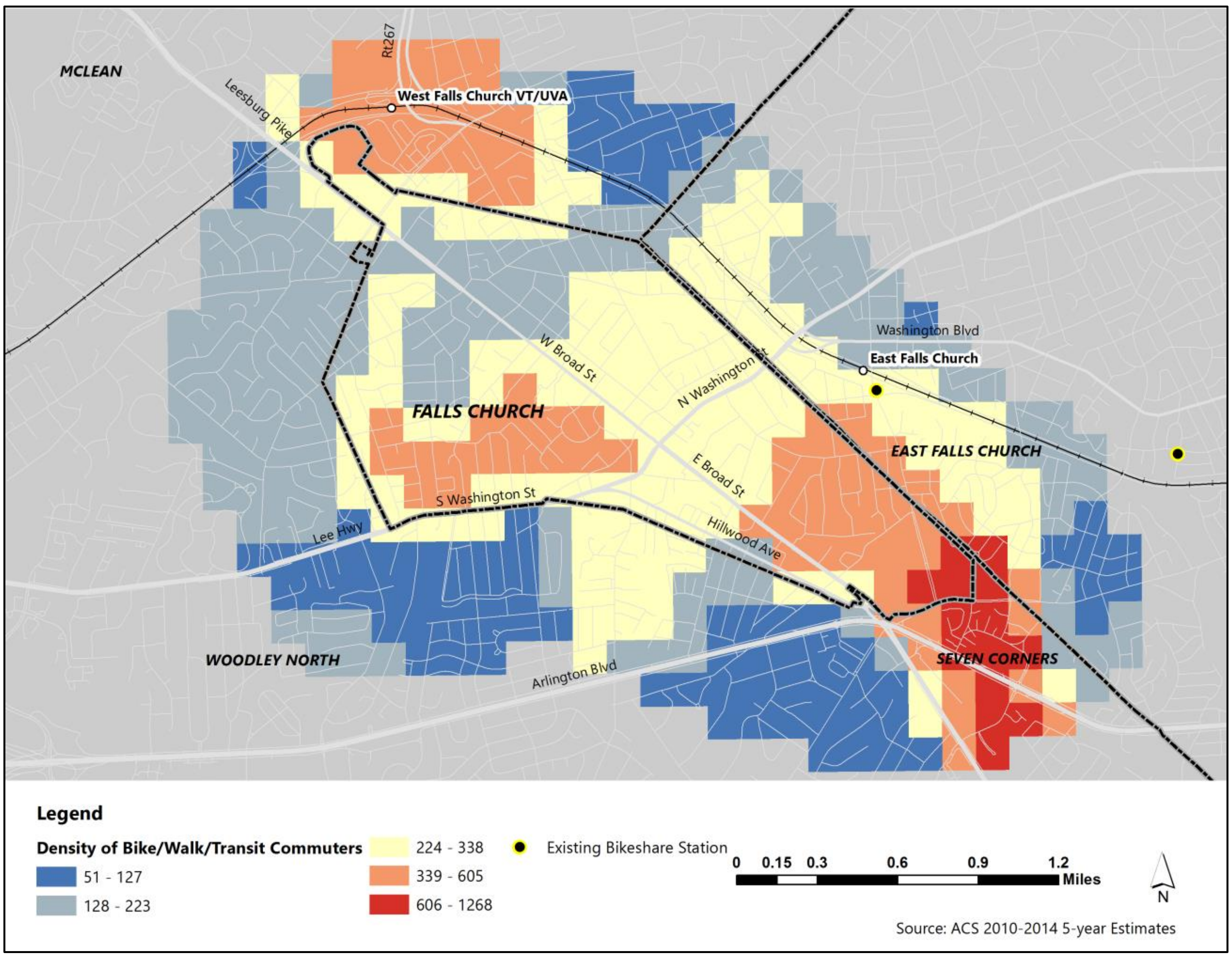
### Methodology

This map displays bicycle, walk, and transit commuter density at the Census Block Group level from the U.S. Census Bureau, American Community Survey (ACS), 2010-2014 5-Year Estimates. The map shows the absolute number of bike, walk, and transit commuters as opposed to the percent of bike, walk, and transit commuters among all commuters. This method ensures that areas with a proportionally high number of bicycle, walk, and transit commuters but an overall small commuting population are not overemphasized. The density is calculated by translating the total number of commuters in a Block Group to a per square mile figure.

### Source

- U.S. Census Bureau, American Community Survey, 2010-2014, 5-Year estimates, Table B08301.

**Figure 11: Density of Bicycle, Walk, and Transit Commuters per Square Mile**



## Measure G: Density of Bicycle Infrastructure

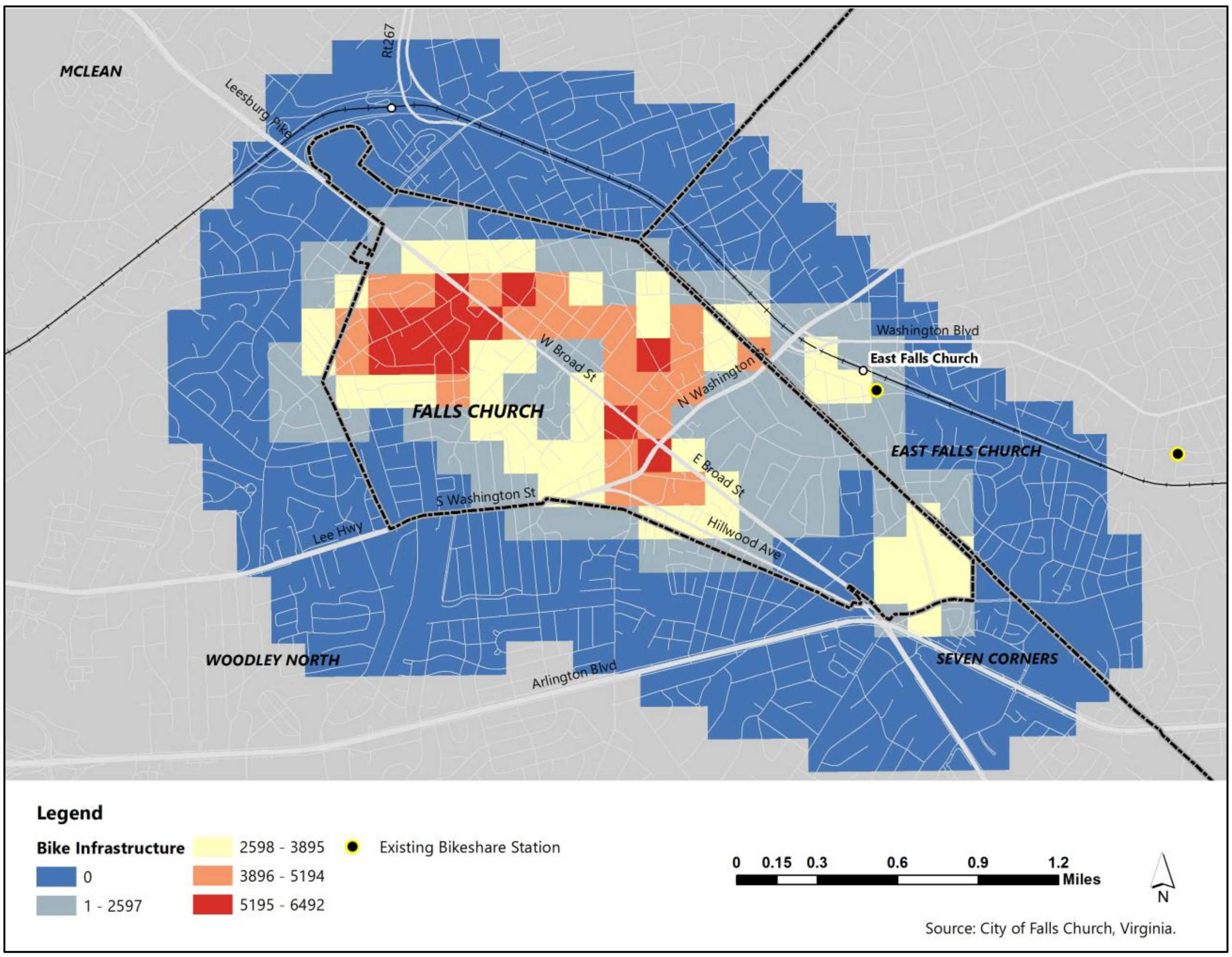
### Methodology

This map measures the feet of bicycle infrastructure within a quarter mile (straight=line distance) of an analysis grid cell. Bicycle infrastructure includes share use roads, bicycle lanes, and off-road paths (including the W&OD trail.

### Sources

- Bike Routes, City of Falls Church 2017.

**Figure 12: Density of Bicycle Infrastructure (Total feet of Infrastructure within a 1/8th of a mile of a cell)**



## Measure H: Density of Points of Interest

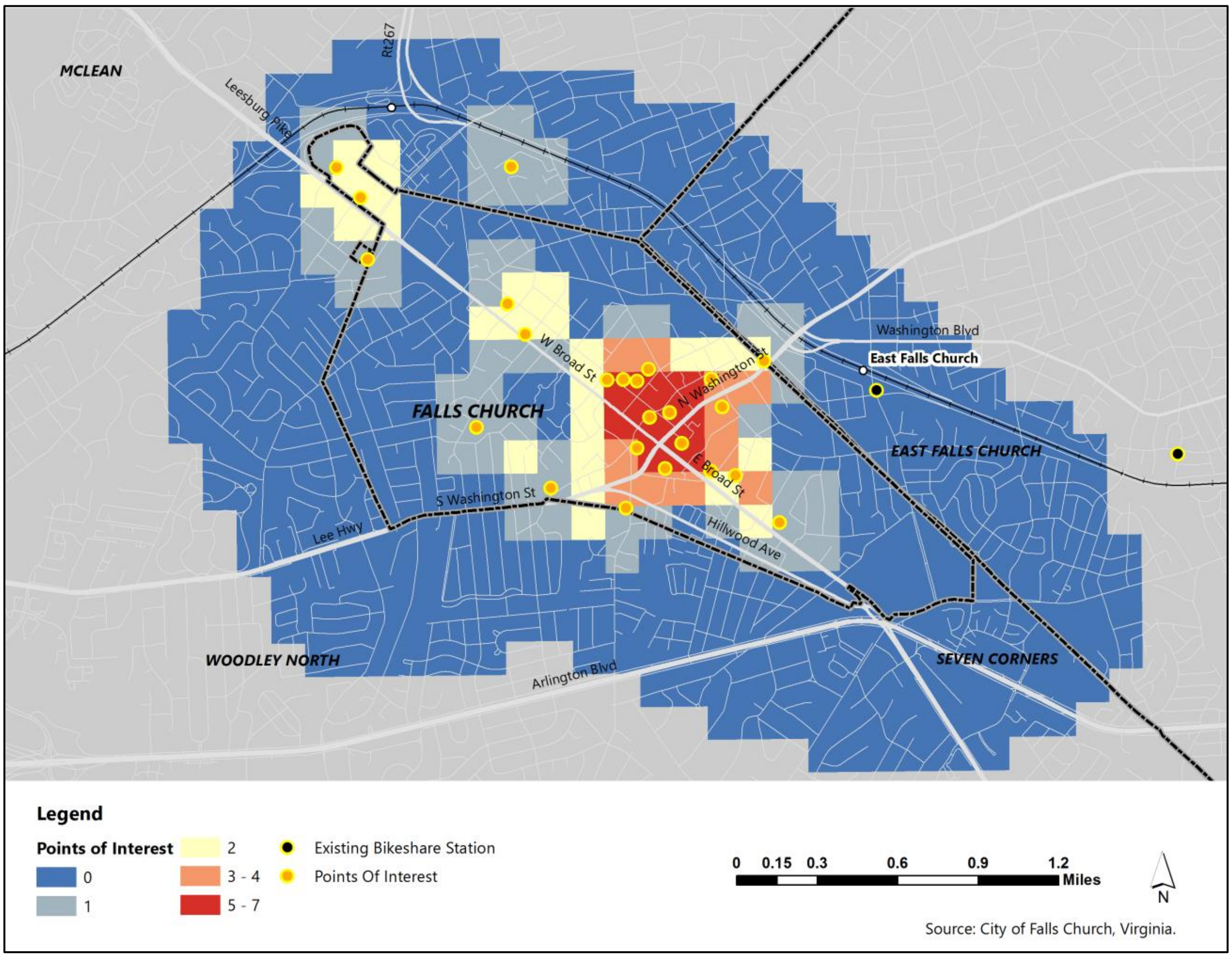
### Methodology

This map is based on the publicly available data of the locations of government facilities, public schools, and religious institutions. The point file behind this data is aggregated to the analysis grid to illustrate the density of public facilities.

### Source

- Points of Interest, City of Falls Church Open Data, 2017.

**Figure 13: Density of Points of Interest**



## Measure I: Density of Parks

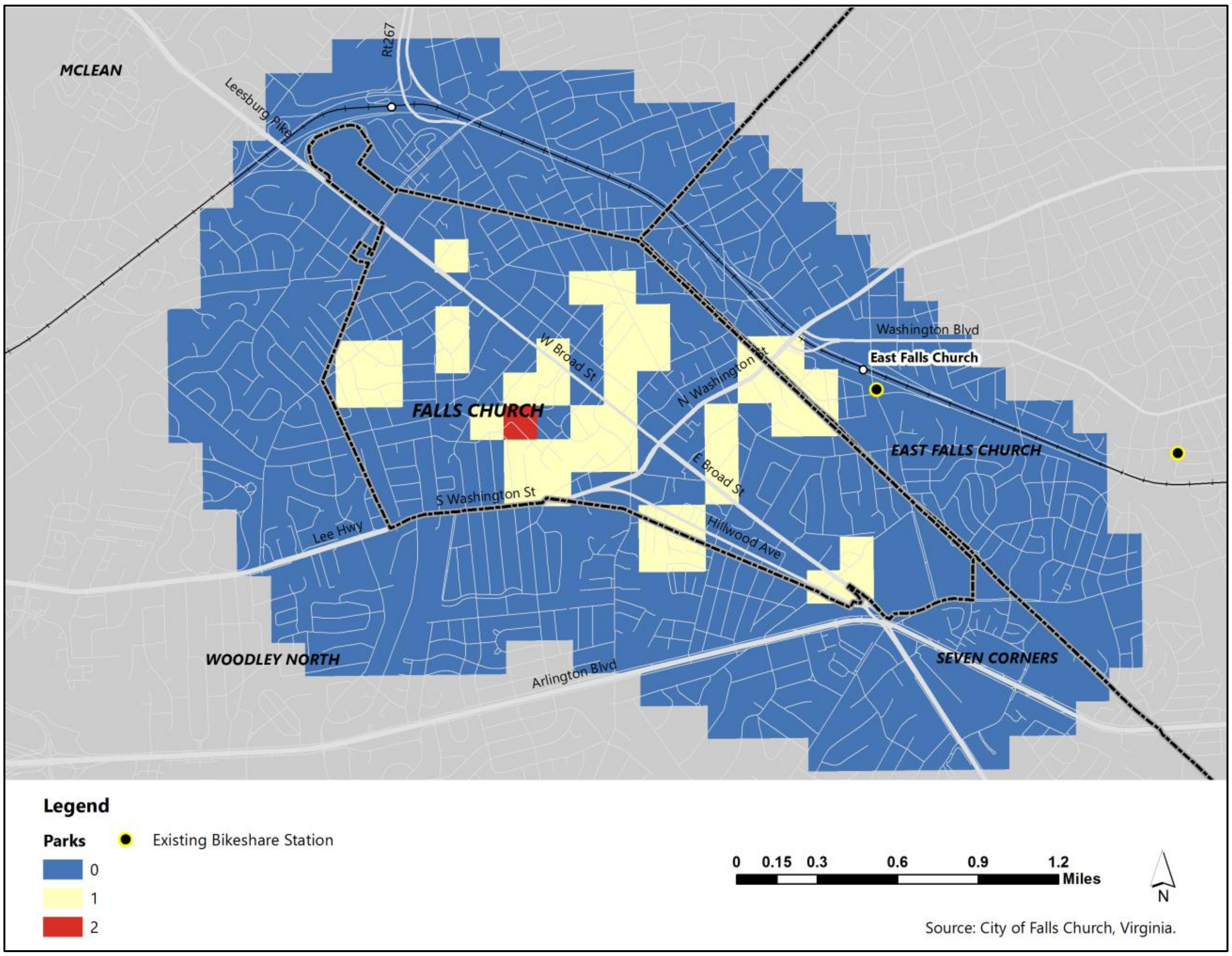
### Methodology

This map is based on the publicly available data of the locations of parks. The polygon file behind this data is aggregated to the analysis grid to illustrate the presence of parks.

### Source

- Parks, City of Falls Church Open Data, 2014.

**Figure 14: Density of Parks**



## Measure J: Change in Elevation

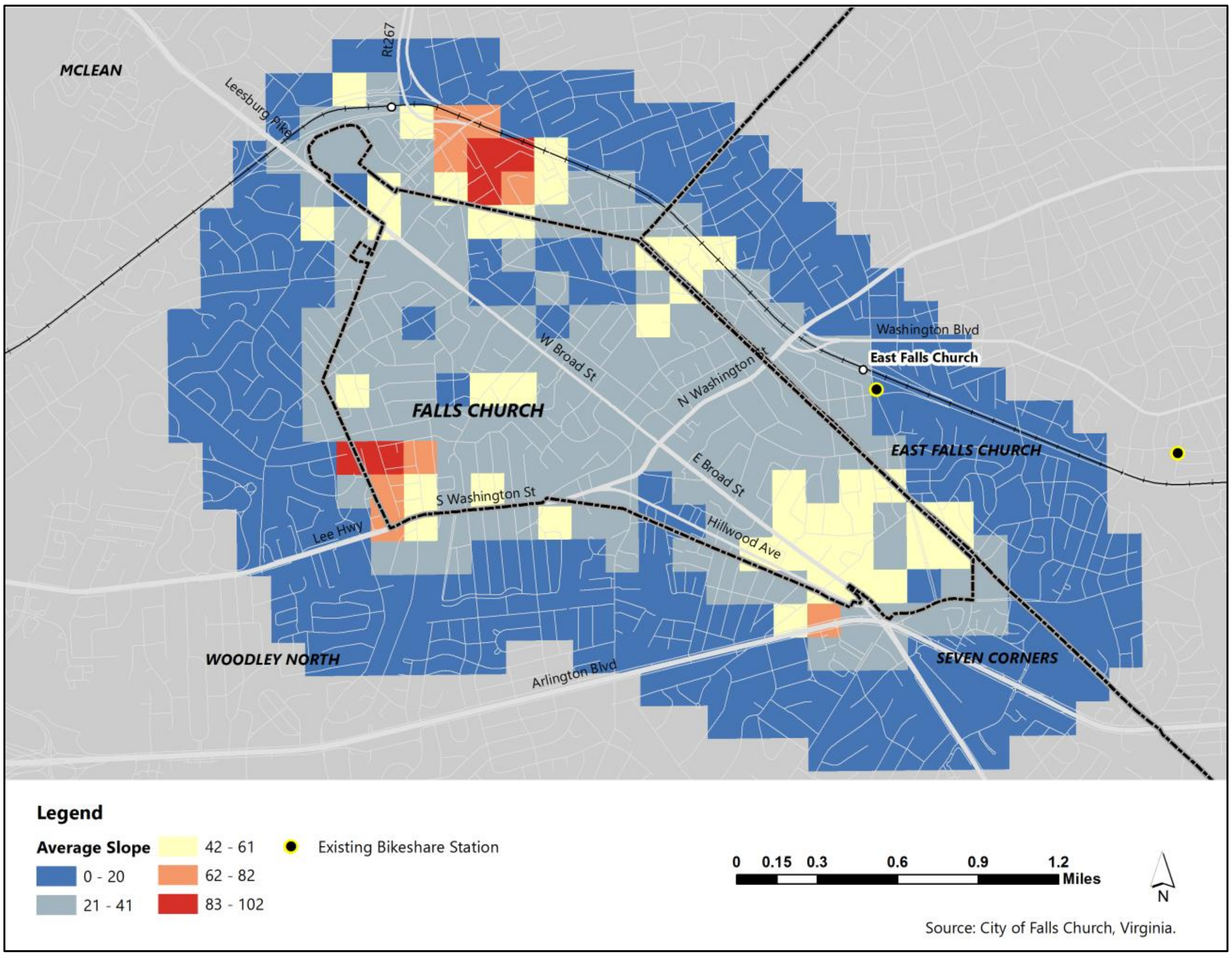
### Methodology

This map is based on the contour line elevation data for the City of Falls Church. Each grid cell is assigned the maximum and minimum elevation that passes through its boundaries.

### Source

- Contours, City of Falls Church Open Data, 2017.

**Figure 15: Changes in Elevation (Feet)**



# APPENDIX B: PROPENSITY MAPPING METHODOLOGY

## Mapping Measures to a Grid

All measurements in the market study were aggregated to an analysis grid that covers the City of Falls Church and neighboring areas within 0.5 miles of the City border. Each analysis grid cell is one eighth by one eighth of a mile in area. Measures were assigned to the grid by simply averaging all values that overlap with a grid cell. Point based measures, like points of interest, are aggregated through a quarter mile search distance.

## Normalizing Data

As the input measures in this analysis feature drastically different ranges and numerical distributions, normalization had to occur to allow for the development of propensity maps. The normalization process serves two purposes. First, it constrains all factors to a range from zero (minimum) to one (maximum). Second, normalization allows for the removal of outliers that can skew the data.

Several methods were utilized to normalize the data to a standard scale (see **Table 11**). For most measures, the cell's value was normalized to its proportion of the maximum value in the sample. To control for outliers, the maximum was defined as a certain percentile (varied based on the distribution but typically either 99$^{th}$ or 95$^{th}$ percentile.

## Combining Data into a Unified Measure

To arrive at the final propensity map, certain factors perceived as more significant were given a double weighting, while the normalized change in elevation was subtracted from the score.

**Table 11: Factors, Normalization Method, and Weighting**

| Measure | Normalization | Weighting by Measure |
|---|---|---|
| **A. Population density** | Proportional method, constrained at zero as the minimum, and the 99$^{th}$ percentile (15,871) as the max score of 1. | 2 |
| **B. Distribution of population under 150 percent of the federal poverty line (definition for low-income)** | Proportional method, constrained at zero as the minimum, and the 95$^{th}$ percentile (3,335) as the max score of 1. | 1 |
| **C. Employment density** | Proportional method, constrained at zero as the minimum, and the 95$^{th}$ percentile (24 jobs per square mile) as the max score of 1. | 2 |
| **D. Density of retail and hospitality employment** | Proportional method, constrained at zero as the minimum, and the 95$^{th}$ percentile (7 jobs per square mile) as the max score of 1. | 1 |
| **E. Density of bicycle commuters** | 95% (204) | 1 |

| Measure | Normalization | Weighting by Measure |
|---|---|---|
| **F. Density of bicycle, walk, and transit commuters** | 95% (543) | 1 |
| **G. Density of bicycle infrastructure** | Proportional method, constrained at zero as the minimum, and the 95th percentile (4,675 feet of bicycle lane/path) as the max score of 1. | 1 |
| **H. Density of points of interest** | 95% (2) | 1 |
| **I. Density of parks** | 95% (1) | 1 |
| **J. Change in elevation (average slope)** | 95% (50) | 1 |

**Table 12: Key Statistics by Analysis Measure**

| Measure | Min | Max | Mean | 99th Percentile | 95th Percentile | Standard Deviation |
|---|---|---|---|---|---|---|
| **A. Population density (per sq. mile)** | 2,632 | 20,790 | 6,208 | 15,872 | 11,817 | 2,778 |
| **B. Low Income Population Density (per sq. mile)** | 0 | 8,886 | 848 | 6,286 | 3,335 | 1,284 |
| **C. Employment density (per acre)** | 0 | 138.33 | 4.76 | 48.37 | 24.15 | 11.53 |
| **D. Density of retail and hospitality employment (per acre)** | 0 | 55.72 | 1.28 | 18.00 | 6.71 | 4.08 |
| **E. Density of bicycle commuters (per sq. mile)** | 0 | 333 | 54 | 257 | 204 | 63 |
| **F. Density of bicycle, walk, and transit commuters (per sq. mile)** | 51 | 1,268 | 255 | 885 | 543 | 170 |
| **G. Density of bicycle infrastructure (within a quarter mile radius area)** | 0 | 6,492 | 1,010 | 5,804 | 4,676 | 1,628 |
| **H. Density of points of interest (within a quarter mile radius area)** | 0 | 7.00 | 0.44 | 6.00 | 2.00 | 1.07 |
| **I. Number of parks** | 0 | 2.00 | 0.10 | 1.00 | 1.00 | 0.31 |
| **J. Change in elevation (average slope)** | 0 | 102 | 18 | 84 | 50 | 20 |

# APPENDIX C: ALTERNATIVE EXPANSION SCENARIOS

The following section highlights the forecasted ridership, capital costs, revenue, and operating costs associated with 10, 11, 12, 13, 14, 15, and 16 station systems.

## 10-Station System

| Operating Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 6 | 8 | 8 | 8 |
| | | | | | |
| User Revenue | $14 | $51 | $57 | $57 | $62 |
| *Regional Revenue Transfer* | *$ 9* | *$ 35* | *$ 37* | *$ 37* | *$ 39* |
| *Memberships* | *$ 4* | *$ 12* | *$ 15* | *$ 15* | *$ 17* |
| *Registered* | *2* | *6* | *7* | *7* | *8* |
| *Casual* | *2* | *6* | *8* | *8* | *9* |
| *Usage Fees* | *$ 1* | *$ 4* | *$ 5* | *$ 5* | *$ 6* |
| *Registered* | *0* | *0* | *0* | *0* | *1* |
| *Casual* | *1* | *4* | *5* | *5* | *5* |
| Advertising Revenue | $ 4 | $ 15 | $ 15 | $ 15 | $ 15 |
| Title Sponsorship | $ 7 | $ 27 | $ 27 | $ 27 | $ 27 |
| Station Sponsorship | $ 3 | $ 13 | $ 14 | $ 14 | $ 15 |
| **Operating Revenue Subtotal** | **$28** | **$106** | **$113** | **$114** | **$118** |
| | | | | | |
| Contractor Operating Costs | $35 | $145 | $150 | $154 | $159 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$178** | **$183** | **$188** | **$194** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 30% | 32% |
| Cost Recovery Ratio | 60% | 60% | 62% | 60% | 61% |
| **Operating Support Needs** | **$19** | **$71** | **$70** | **$75** | **$76** |

| New Capital Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 0 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 0 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $0 | $0 | $0 | $0 |
| Installation Costs | $60 | $0 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$0** | **$0** | **$0** | **$0** |

## 11-Station System

| **New Capital Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 1 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 6 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $35 | $0 | $0 | $0 |
| Installation Costs | $60 | $6 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$41** | **$0** | **$0** | **$0** |

| **Operating Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 7 | 8 | 8 | 9 |
| | | | | | |
| User Revenue | $14 | $54 | $61 | $62 | $67 |
| *Regional Revenue Transfer* | *$ 9* | *$ 38* | *$ 40* | *$ 40* | *$ 42* |
| *Memberships* | *$ 4* | *$ 12* | *$ 16* | *$ 16* | *$ 18* |
| *Registered* | *2* | *6* | *8* | *8* | *9* |
| *Casual* | *2* | *6* | *8* | *8* | *9* |
| *Usage Fees* | *$ 1* | *$ 4* | *$ 5* | *$ 6* | *$ 6* |
| *Registered* | *0* | *0* | *0* | *1* | *1* |
| *Casual* | *1* | *4* | *5* | *5* | *6* |
| Advertising Revenue | $ 4 | $ 16 | $ 17 | $ 17 | $ 17 |
| Title Sponsorship | $ 7 | $ 27 | $ 27 | $ 27 | $ 27 |
| Station Sponsorship | $ 3 | $ 13 | $ 14 | $ 14 | $ 15 |
| **Operating Revenue Subtotal** | **$28** | **$111** | **$119** | **$120** | **$125** |
| | | | | | |
| Contractor Operating Costs | $35 | $157 | $165 | $170 | $175 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |

| | | | | | |
|---|---|---|---|---|---|
| **Operating Cost Subtotal** | **$46** | **$190** | **$198** | **$204** | **$210** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 30% | 32% |
| Cost Recovery Ratio | 60% | 59% | 60% | 59% | 59% |
| **Operating Support Needs** | **$19** | **$79** | **$79** | **$84** | **$85** |

## 12-Station System

| **New Capital Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 2 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 12 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $69 | $0 | $0 | $0 |
| Installation Costs | $60 | $12 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$81** | **$0** | **$0** | **$0** |

| **Operating Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 7 | 8 | 9 | 9 |
| | | | | | |
| User Revenue | $14 | $58 | $66 | $67 | $72 |
| *Regional Revenue Transfer* | *$ 9* | *$ 41* | *$ 44* | *$ 44* | *$ 46* |
| *Memberships* | *$ 4* | *$ 13* | *$ 16* | *$ 17* | *$ 19* |
| *Registered* | *2* | *6* | *8* | *8* | *9* |
| *Casual* | *2* | *6* | *8* | *9* | *10* |
| *Usage Fees* | *$ 1* | *$ 4* | *$ 6* | *$ 6* | *$ 7* |
| *Registered* | *0* | *0* | *1* | *1* | *1* |
| *Casual* | *1* | *4* | *5* | *5* | *6* |
| Advertising Revenue | $ 4 | $ 18 | $ 18 | $ 18 | $ 18 |
| Title Sponsorship | $ 7 | $ 27 | $ 27 | $ 27 | $ 27 |
| Station Sponsorship | $ 3 | $ 13 | $ 14 | $ 14 | $ 15 |

| | | | | | |
|---|---|---|---|---|---|
| **Operating Revenue Subtotal** | **$28** | **$116** | **$125** | **$126** | **$131** |
| | | | | | |
| Contractor Operating Costs | $35 | $170 | $180 | $185 | $191 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$202** | **$213** | **$219** | **$226** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 57% | 59% | 58% | 58% |
| **Operating Support Needs** | **$19** | **$86** | **$88** | **$93** | **$94** |

## 13-Station System

*See financial tables in main report*

## 14-Station System

| **New Capital Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 4 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 24 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $138 | $0 | $0 | $0 |
| Installation Costs | $60 | $25 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$163** | **$0** | **$0** | **$0** |

| **Operating Costs ($1,000)** | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 7 | 9 | 10 | 10 |
| | | | | | |
| User Revenue | $14 | $65 | $76 | $76 | $82 |
| *Regional Revenue Transfer* | *$ 9* | *$ 47* | *$ 51* | *$ 51* | *$ 54* |
| *Memberships* | *$ 4* | *$ 14* | *$ 18* | *$ 19* | *$ 21* |
| *Registered* | *2* | *7* | *9* | *9* | *10* |
| *Casual* | *2* | *7* | *9* | *10* | *11* |
| *Usage Fees* | *$ 1* | *$ 5* | *$ 6* | *$ 7* | *$ 7* |
| *Registered* | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *0* | *0* | *1* | *1* | *1* |
| *Casual* | *1* | *4* | *6* | *6* | *7* |
| Advertising Revenue | $ 4 | $ 20 | $ 21 | $ 21 | $ 21 |
| Title Sponsorship | $ 7 | $ 27 | $ 27 | $ 27 | $ 27 |
| Station Sponsorship | $ 3 | $ 13 | $ 14 | $ 14 | $ 15 |
| **Operating Revenue Subtotal** | **$28** | **$125** | **$137** | **$139** | **$145** |
| | | | | | |
| Contractor Operating Costs | $35 | $194 | $210 | $216 | $222 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$226** | **$243** | **$250** | **$258** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 56% | 57% | 55% | 56% |
| **Operating Support Needs** | **$19** | **$101** | **$105** | **$111** | **$113** |

## 15-Station System

| New Capital Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 5 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 30 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $173 | $0 | $0 | $0 |
| Installation Costs | $60 | $31 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$203** | **$0** | **$0** | **$0** |

| Operating Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 8 | 10 | 10 | 10 |
| | | | | | |
| User Revenue | $14 | $69 | $80 | $81 | $87 |
| *Regional Revenue Transfer* | *$ 9* | *$ 50* | *$ 55* | *$ 55* | *$ 58* |
| *Memberships* | *$ 4* | *$ 14* | *$ 19* | *$ 20* | *$ 22* |
| *Registered* | *2* | *7* | *9* | *10* | *11* |

| | | | | | |
|---|---|---|---|---|---|
| *Casual* | *2* | *7* | *10* | *10* | *11* |
| *Usage Fees* | *$1* | *$5* | *$7* | *$7* | *$8* |
| *Registered* | *0* | *0* | *1* | *1* | *1* |
| *Casual* | *1* | *4* | *6* | *6* | *7* |
| Advertising Revenue | $4 | $21 | $23 | $23 | $23 |
| Title Sponsorship | $7 | $27 | $27 | $27 | $27 |
| Station Sponsorship | $3 | $13 | $14 | $14 | $15 |
| **Operating Revenue Subtotal** | **$28** | **$130** | **$144** | **$145** | **$151** |
| | | | | | |
| Contractor Operating Costs | $35 | $206 | $225 | $231 | $238 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$238** | **$258** | **$265** | **$273** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 55% | 56% | 55% | 55% |
| **Operating Support Needs** | **$19** | **$108** | **$114** | **$121** | **$122** |

## 16-Station System

| New Capital Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| # of New Stations | 10 | 6 | 0 | 0 | 0 |
| # of New Bicycles | 60 | 36 | 0 | 0 | 0 |
| | | | | | |
| Equipment Purchases | $337 | $207 | $0 | $0 | $0 |
| Installation Costs | $60 | $37 | $0 | $0 | $0 |
| Misc. Launch Costs | $43 | $0 | $0 | $0 | $0 |
| **Sub-Total** | **$440** | **$244** | **$0** | **$0** | **$0** |

| Operating Costs ($1,000) | | | | | |
|---|---|---|---|---|---|
| | FY18 | FY19 | FY20 | FY21 | FY22 |
| Annual Ridership (1,000s) | 2 | 8 | 10 | 10 | 11 |
| | | | | | |
| User Revenue | $14 | $72 | $85 | $86 | $92 |
| *Regional Revenue Transfer* | *$9* | *$52* | *$58* | *$58* | *$62* |

| | | | | | |
|---|---|---|---|---|---|
| *Memberships* | *$ 4* | *$ 15* | *$ 20* | *$ 21* | *$ 23* |
| *Registered* | *2* | *7* | *10* | *10* | *11* |
| *Casual* | *2* | *7* | *10* | *10* | *12* |
| *Usage Fees* | *$ 1* | *$ 5* | *$ 7* | *$ 7* | *$ 8* |
| *Registered* | *0* | *0* | *1* | *1* | *1* |
| *Casual* | *1* | *5* | *6* | *7* | *7* |
| Advertising Revenue | $ 4 | $ 23 | $ 24 | $ 24 | $ 24 |
| Title Sponsorship | $ 7 | $ 27 | $ 27 | $ 27 | $ 27 |
| Station Sponsorship | $ 3 | $ 13 | $ 14 | $ 14 | $ 15 |
| **Operating Revenue Subtotal** | **$28** | **$135** | **$150** | **$151** | **$158** |
| | | | | | |
| Contractor Operating Costs | $35 | $218 | $240 | $247 | $254 |
| Admin | $5 | $19 | $20 | $20 | $21 |
| Marketing | $6 | $13 | $13 | $14 | $14 |
| **Operating Cost Subtotal** | **$46** | **$250** | **$273** | **$281** | **$289** |
| | | | | | |
| User Revenue Recovery | 30% | 29% | 31% | 31% | 32% |
| Cost Recovery Ratio | 60% | 54% | 55% | 54% | 55% |
| **Operating Support Needs** | **$19** | **$115** | **$123** | **$130** | **$132** |